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CHINA REPORT  
SCIENCE AND TECHNOLOGY  
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## APPLIED SCIENCES

### APPRAISAL OF HE-NE LASERS IN CHINA

Shanghai JIGUANG [LASER JOURNAL] in Chinese No 2, Feb 82 p 80

[Article by Ji Zhong [4764 6945]: "Preliminary Nationwide Evaluation of the Quality of He-Ne Laser Products"]

[Text] The State Scientific and Technological Commission held a meeting 9-11 September 1981 and expressed satisfaction with the results of preliminary nationwide evaluations of the quality of He-Ne laser products. It also announced that a reevaluation and third evaluation would be conducted to affirm the reward to those units whose products maintain their quality and steadily improve their quality. The State Scientific and Technological Commission decided 2 years ago to conduct quality evaluation and comparison of He-Ne laser products to stimulate improvement in their quality and to facilitate the application and popularization of laser technology.

The evaluation and comparison were sponsored jointly by the First Bureau of the State Scientific and Technological Commission, the Technical Sciences Department of the Chinese Academy of Sciences, the Science and Technology Bureau of the Ministry of Education, the Science and Technology Bureau of the Fourth Ministry of Machine Building, the National Bureau on Instruments and Meters, and the National Bureau of Weights and Measures, which formed a special leading group and commissioned the technicians of the Beijing Photoelectric Technology Institute, the Shanghai Optics and Precision Instruments Institute, the Physics Department of Nankai University, the Standardization Institute of the Fourth Ministry of Machine Building, the Shenyang Instruments and Meters Technology Institute, and the Weights and Measures Science Research Academy to organize an evaluation and comparison team. The varieties of products, their conditions, sampling methods, categories of evaluation and comparison, rules of grading, and the methods of testing were all clearly stipulated. According to these rules, the varieties of He-Ne laser products participating in the 1980-81 quality evaluation and comparison were limited to lasers (including exposed laser tubes or encased ones) within a length of 250 millimeters  $\pm 5$  millimeters, and they must be of a complete inner cavity type with an output in the TEM<sub>00</sub> mode. At the same time, products participating in the evaluation and comparison must have passed national evaluation before or must have been recommended by concerned departments and provincial and municipal science committees. The units providing the products for evaluation and comparison

must have a definite production output and must be able to supply the needs of the users. In addition, the units providing products for evaluation and comparison must include explanatory information about the products and their major technical specifications and data. The evaluation and comparison also must select 4 sample products out of no less than 30 products (one reserve) for inspection.

This evaluation and comparison event was participated in by 18 units. A total of 54 sample laser tubes were selected. The testing categories included: best operating current, operating voltage, glowing voltage, limiting resistance, output mode, output power, power stability, laser beam (zero) drift, laser beam divergence, and operating stability test under three environments--a high-temperature environment, a low-temperature environment and a damp environment. In addition, performance checks were performed after 5000 hours of storage, and operating life tests of 5000 hours of continuous operation were conducted.

Testing was done entirely by the Beijing Photoelectric Technology Institute. The institute established strict criteria and limitations on test instruments, test conditions and testing personnel in order to reduce instrument errors and subjective errors as much as possible.

The test results showed:

Of the 54 laser tubes, 74.1 percent passed the type criteria.

One hundred percent of 40 laser tubes generating power in the output TEM mode were qualified, 70 percent passed the power stability test, 95 percent passed the light beam (zero) drift test, 97.5 percent passed the environmental test, 92.9 percent passed the storage life test, and 50 percent passed the operating life test.

Of the 54 laser tubes, only 20 passed all parametric and conditional tests, constituting 37 percent.

The results\* of evaluation calculated according to the grading standards are as follows:

Unit	Score	Rank
Shenyang Light Bulb Plant	108.6	1
Wuhan Optical Instruments Plant	100.7	2
Beijing Zhaoyang Laser Machinery Plant	100.6	2
State-run 772 Plant	88.9	3
Shanghai Glass Instruments Plant No 1	88.3	3
Chengdu Thermometer Plant	87.1	3
State-run 740 Plant	80-70	4
Shanghai Haiguang Optical Elements Plant	80-70	5
Tianjin Semiconductor Accessories Plant No 2	80-70	6
Wuxi Luoshe Radio Components Plant	80-70	7
Zhongshan University	80-70	8
Dalian Engineering Academy	80-70	9

[continued]

[Evaluation results continued]

\*Three factories scored below 60 points. Three other factories lost their qualification because their laser output was in the multiple mode.

Future reevaluation and third evaluation will be decided on and announced by the State Scientific and Technological Commission, and concrete methods will be proposed. It is hoped that the various factories producing He-Ne lasers will participate in these product quality competitions.

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CSO: 4008/127

## APPLIED SCIENCES

### ABSTRACTS OF PAPERS AT 81 CONFERENCE OF SHANGHAI LASER SOCIETY

Shanghai JIGUANG [LASER JOURNAL] in Chinese No 2, Feb 82 pp 93-105, 126

["Collection of Abstracts Presented at 81 Conference of Shanghai Laser Society"]

[Text] The academic reporting conference of the Shanghai City Laser Society convened every 2 years was held from 22 to 24 September 1981. It mainly reflected local progress in laser research and developments in laser technology during the past 2 years.

#### Applied Optics

##### Strehl Criterion and Fourier Transform Lens

Xu Fuhou [1776 4395 0186] (Shanghai Optical Instruments Research Institute)

This article discussed the relationship between Seidel aberration and  $S_c$  of the Fourier transform lens on the basis of the Strehl criterion. Some useful results were obtained.

##### On Using Interference of Scattered Laser Spots To Separate Inner Surface Displacement and Normal Displacement

Liu Yeying [0491 8518 5391] (Shanghai City Laser Technology Research Institute)

In the measurement of inner surface displacement using scattered laser spots, the spots will affect the streaks if normal displacement of the object is still present. This article proposed the use of two interference patterns of two scattered spots obtained at two different distances from the object to separate the two kinds of displacement.

##### Theoretical Analysis of the Grating Harmonic Cavity

Wang Yumin [3679 5940 3046] (Shanghai Optics and Precision Instruments Institute of the Chinese Academy of Sciences)

Starting out from the integral equations of the Kirchhoff-Fresnel diffraction, this article proved that the "grating harmonic cavity" is equivalent to an ordinary harmonic cavity with a slanted reflecting mirror. It calculated the selective characteristics of the parallel plane-grating cavity and the spherical surface-grating cavity in selecting the wavelengths of the oscillating spectral lines.

#### Moire Effect

Huang Weishi [7806 4850 1395] (Department of Applied Physics of Shanghai Jiaotong University)

A slit grating and its shadow projected on a diffusion surface will form Moire bands. They contain information on the height (position) of the contour surface to be measured.

This article derived the mathematical expression of the Moire pattern in any position, and it used the expression as the condition of the contour lines. The article also provided experimental data and included pictures showing stationary Moire contour patterns and the patterns formed during the course of rapid change.

#### Analysis of the Added Acousto-Optic Diffraction in the Fused Quartz Acousto-Optic Q Switch

Sun Zongjian [1327 1350 1696] (Physics Department of Tongji University)

This article analyzed diffraction using the azimuth of diffraction, the diffraction angle, the strong angle, the direction of polarization and the different acousto-optic diffraction characteristics manifested by longitudinal and transverse waves (sound waves). Diffraction photographs were taken.

#### Designing a Laser Interference System for Positioning and Length Measurements

Wu Yongfang [0702 3057 2455] (Shanghai Science and Technology University)

This article summarized principles obtained in designing a laser interference system during past years. The principles included eliminating excess limitations on the degree of freedom, least face, thickness, wedge, collimation of the laser beam, the principle that the laser beam should be consistent with Gaussian propagation, using the oblique irradiation method to eliminate reflection and the principle of distribution. Via discussion of these principles, the article provided a method for further improvement of the precision of a laser interference system for positioning and length measurements, and it proposed an interference system for positioning and length measurements for some high-precision equipment.

#### Laser Physics

##### The Model of the Conversion Particle of Photons and Elementary Particles

Song Mingzhao [1345 6900 6856] (Shanghai Optics and Precision Instrument Institute of the Chinese Academy of Sciences)

Photons and all elementary particles are composed of several much smaller subatomic material particles--called conversion particles--that carry an integral charge. The mutual conversion between elementary particles is a simple change in the combinatorial relationship of conversion particles. Quark does not exist. Quark is the description of the spatial distribution of the conversion particles.

#### Collision Due to Variation in the Velocity of Atoms During Polarization in Modulated Excitation Spectroscopy

Shen Weidian [3088 4850 3329] and Wang Zhaoyong [3769 0340 3057] Fudan University

This article systematically introduced the basic principles of modulated excitation spectroscopy in polarization, and it used two methods, the velocity

equations and the semiclassical model, to analyze the mechanism of eliminating the Doppler background caused by collision due to the variation in the velocities of atoms.

**The Analytic Solution of the Equations of Mutual Action Between Light and a System of Atoms with Two Energy Levels**

Wang Runwen [3769 3387 2429] (Shanghai Optics and Precision Instruments Institute of the Chinese Academy of Sciences)

This article utilized the simple analytic expression of the jump probability obtained under different conditions to provide a more convenient mathematical form for the analytic study of the jump process.

**Producing Optically Pumped Coherent Radiation of Opposite Parity States in Rubidium Vapor (OPSE)**

Lin Yuanqi [2651 6678 7871], Qin Lijuan [4440 5461 1227], and Wang Zugeng [3769 4371 6342] (Physics Department of Huadong Normal University)

Recently, we produced coherent radiation of 4d-5p in the electrical dipole prohibited 5S-4d energy level jump in the metallic element rubidium (Rb).

**Generation of the High-Power Second Harmonic of a Nd:YAG Laser**

Wu Huifa [0702 1920 3127] and Xu Huide [1776 1920 1795] (Shanghai Silicates Institute of the Chinese Academy of Sciences)

The BSN nonlinear element was used in an Nd:YAG laser cavity of 1.06 micrometers to obtain a continuous wave of 0.53 micrometers with 2.5 watts of power from the second harmonic.

**Study of the Stability of the Spectral Line Tunable Folded-Composite Cavity**  
Zhao Youyuan [6392 2589 3293], Gao Refang [7559 1172 5364], Qian Hongsheng [6929 4767 5116] and He Maoqi [0149 2021 3825] (Laser Physics Research Laboratory of the Physics Department of Fudan University)

We previously described how to use the folded-composite cavity to obtain a harmonic output of 80 watts. In this article, we concentrated on the discussion of using this cavity to obtain spectral line stability and power stability over a long duration. We also explained that this cavity can automatically control the degree of stability of the spectral lines.

**Noise Characteristics of a Helium-Cadmium Laser**

Zeng Yongchao [2582 3057 6389] et al (Shanghai City Laser Technology Research Institute)

This article observed the relationship between the blue wave, the gas pressure difference, the traveling striae and the noise of the helium-cadmium laser, explained the cause of the noise, and obtained a helium-cadmium laser of low noise and large power of over 100 milliwatts.

**Study of the Spectroscopic Technique of High-Level Coherent Raman Scattering**  
Wang Fugui [3769 4395 6311], Yu Bingkun [0151 8506 7649], Liu Min [0491 2404], Chen Yishen [7115 1150 0581], Zhou Fuxin [0719 4395 2450] and Liu Songhao [0491 7313 6275] (Shanghai Optics and Precision Instruments Institute of the Chinese Academy of Sciences)

This article introduced in relative detail the spectroscopic technique of coherent Raman scattering and the experimental equipment and obtained



experimental conditions for high-level coherent Raman scattering. It also discussed and analyzed the experimental results.

**Experimental Study of Brillouin Scattering by Excitation of a Weak Signal**  
Xu Jie [1776 2212], Chen Yuming [7115 6877 2494] and He Guozhen [0149 0948 3791] (Shanghai Optics and Precision Instruments Institute of the Chinese Academy of Sciences)

This article reported of the experimental study of Brillouin scattering produced by the excitation of a weak signal. When a strong wave and a weak wave enter a chamber filled with a  $\text{CS}_2$  medium simultaneously, wavefront inversion of the weak signal was observed.

**The Use of Raman Scattering of Excited Electrons in Cesium (Cs) Vapor to Produce High Power Micromicrosecond Infrared Pulses**

He Kexiang [0149 0344 4382], Hui Lingkai [1920 0109 0418], Cui Junwen [1508 0193 2429], Li Qun [4539 5028] and Liu Songhao [0491 7313 6275] (Shanghai Optics and Precision Instruments Institute of the Chinese Academy of Sciences)  
A pulse train of 527 millimicrometers lasting 30 micromicroseconds produced Raman scattering of excited electrons in cesium vapor and an output of 2.38 micrometers of 1 millijoule. Experimental parameters were given.

**Study of the Competitive Effects Between Parametric Oscillations of Backward Waves and Excited Raman Scattering**

Fan Junyin [5400 0193 7336], We Cunkai [0702 1317 1956], Wang Zhiying [3769 1807 5391] (Shanghai Optics and Precision Instruments Institute of the Chinese Academy of Sciences)

This article reported on the experiment and the theoretical study of the competitive effects among the parametric oscillations of the backward waves produced by a simple combination of four waves, frequency mixing and excited Raman scattering.

**Chromatographic Study of Splitting a Carbon Dioxide Laser of High Polymers**  
Shu Jingzhi [5289 2417 0237] (Shanghai Organic Chemistry Institute of the Chinese Academy of Sciences)

The split chromatogram of a  $\text{CO}_2$  laser was used for quick analysis of the composition of the monomer of the trifluorochlorethylene-metafluoroethylene copolymer ( $\text{F}_{23}$ ). The ratio of the height of the crest and the area of the crest of trifluorochlorethylene to those of metafluoroethylene in the split spectrogram and the composition of two monomers in the copolymer are linearly related. Experimental results showed that the data obtained by laser splitting were consistent with the standard analysis of elements (measuring the content of chlorine).

**Micromicrosecond Coherent Anti-Stokes Raman Scattering**

Liu Songhao [0491 7313 6275] et al (Shanghai Optics and Precision Instruments Institute of the Chinese Academy of Sciences)

Research was centered around the experimental techniques of using a tunable micromicrosecond harmonic laser to produce coherent anti-Stokes Raman scattering in benzene.

## Laser Devices

### An Injection Lock Mode Dye Laser Produced by an Injected Light Source Using a Pulsed Xenon Ion Pump

Yang Yuanlong [2799 6678 7893], Sun Diechi [1327 6613 4609], Weng Yumin [5040 5254 0682], Li Fuming [2621 1381 6900] and Zhang Zhiming [4545 1807 7686] (Physics Department of Fudan University)

An injection lock mode dye laser was described. It used a four mirror ring laser filled with rhodamine 6G with an attached pulsed xenon ion laser pump. The 5960Å output line of the xenon ion laser was used as the injecting light source. The output intensity and spectral characteristics of the injection lock mode dye laser were studied.

### Experimental Study of the Highly Efficient Laser Dye DCM

Shao Ziwei [6730 1311 2429], Yue Chuanhua [1471 0278 5478] and Ma Meili [7456 5019 7787] (Shanghai City Laser Technology Research Institute)

This article introduced the most recent experimental results in the study of the new laser dye DCM which is highly efficient in the red light range, including its harmonic characteristics, conversion efficiency and the life of its fluorescence.

### Distributed Feedback Dye Laser

Don Gengfa [5516 5087 4099], Li Yufen [26216735 5358], Jin Yaogeng [6855 5069 2704] et al (Physics Department of Fudan University)

This article introduced a simple, clustered, tunable distributed feedback dye laser which does not have wavelength selector.

Selection of wavelength and tuning were realized by the Bragg diffraction of periodic structure modulated by the gain in the dye.

### A Room Temperature CO Laser Produced by Selecting Molecular Fragments Has Operated for Over 6,500 Hours

Zhang Shunyi [1728 7311 1837] et al (Shanghai Optics and Precision Instruments Institute of the Chinese Academy of Sciences)

This article reported on an insulated and sealed room temperature CO laser produced by selecting molecular fragments for emission. It has operated for over 6,500 hours and it is hoped that its operating life can be extended.

### High-Power Long-Life Helium-Cadmium Laser

Qu Shipu [2575 0013 3184] and Jin Guojiang [6855 0948 3068] (Shanghai City Laser Technology Research Institute)

This article reported on the experimental results of using a special technique to obtain a high-power and long-lasting He-Cd laser. It reported on the development of a laser with a discharge length of 140 to 150 centimeters. Its maximum single mode output surpassed 100 milliwatts. The life of an experimental laser with a discharge length of 125 centimeters surpassed 3,500 hours.

### Stable and Coherent Infrared Radiation Obtained from the Nonlinear Effects of an Alkaline Metal Vapor

Lin Yuanqi [2651 6678 7871], Qin Lijuan [4440 5461 1227] and Wang Zugeng [3769 4371 6342] (Physics Department of Huadong Normal University)



We used the nonlinear polarization characteristics of an alkaline metal to convert a laser from visible light to the infrared range and used it to obtain coherent infrared radiation.

#### Continuous Wave Far Infrared Methanol Laser

Fu Ensheng [0265 1869 3932], Wang Zhongzhi [3769 1813 5071] and Shi Peishen [4258 1014 2573] (Shanghai Optics and Precision Instruments Institute of the Chinese Academy of Sciences)

A light pumped continuous wave far infrared methanol laser reached a highest output power of 12 milliwatts on the 70, 119, 392, 418, and 570 micrometer wavelengths.

#### Laser Effects in an Indium Hollow Cathode Discharge

Lin Fucheng [2651 4395 2052] (Shanghai Optics and Precision Instruments Institute of the Chinese Academy of Sciences)

Laser effects of 468.1, 689.2, 1342.8 and 1720 millimicrometers were produced in an indium hollow cathode discharge laser. The continuous 468.1-millimicrometer and 1720-millimicrometer ionic lines were excited by the electric charge exchange effect. The 689.2-millimicrometer ionic line was excited by cascade radiation. A 1342.8-millimicrometer atomic line appeared in the afterglow stage of the pulsed discharge. Its population inversion was produced by combinations of the indium ions and electrons.

#### New Ultraviolet Laser Oscillations of Chlorine

Qiu Mingxin [6726 2494 2450] et al (Shanghai City Laser Technology Research Institute)

This article reported on five new ultraviolet laser spectral lines of chlorine ions and the observation that the gain of the known spectral line of 263.3 millimicrometers was larger than 30 percent per meter.

#### Four New Ultraviolet Laser Spectral Lines of Oxygen

Zhou Zhengzuo [0719 2398 0587] et al (Shanghai City Laser Technology Research Institute)

This article reported on four new laser spectral lines of 305.9, 370.3, 372.7 375.7 millimicrometers and measurements showing that the pulse width of the 372.7-millimicrometer laser was larger than the discharge pulse width by one magnitude; therefore it was a compound laser.

An Ultrashort Pulse Laser with a Double Circuit Tunable and Asynchronous Pump  
Cui Junwen [1508 0193 2429], Li Qun [4539 5028], Hui Ling kai [1920 0109 0418] and Liu Songhao [0491 7313 6275] (Shanghai Optics and Precision Instruments Institutes of the Chinese Academy of Sciences)

This article reported on the experimental results of obtaining a tunable ultrashort pulse from a double circuit dye laser with a second harmonic pump of an active-passive locked mode phosphate neodymium glass laser.

#### An Argon Ion Laser with a New Type of Structure

Liang Sheng [2733 0524] (Research Laboratory of the Shanghai Yaming Light Bulb Plant)

This article introduced an argon ion laser of a newly designed structure based on improvements of the original argon laser and on the structural

characteristics of the CR-8 and the actual situation in our nation and our plant. Related units used the laser and the results were good. The output power of the laser reached 6 to 8 watts, and its useful life lasted 700 hours. The design of the laser has already been finalized and the laser can be batch-produced at present.

#### Experimental Study of the High-Frequency Acousto-Optic Repetitively Q-Switched Yttrium Aluminate Laser

Gong Huanming [7895 3562 2494] and Tang Chunming [0781 2504 2494] (Shanghai City Laser Technology Research Institute)

We measured the light polarization characteristics, the quality of the light beam, the width of the light pulse, the peak value power of the light pulse of the high-frequency acousto-optic repetitively Q-switched mixed neodymium YAP laser and conducted mode selection experiments. We obtained a single transverse mode output.

#### The Silver Ion Hollow Cathode Ultraviolet 3183A Laser

Mo Yingan [5459 2019 1344] (Physics Department of Fudan University)

The report described a continuous and a quasicontinuous ultraviolet 3183A silver ion hollow cathode discharge laser and gave the structure of the device and some experimental results.

#### Functional Materials, Components

##### The Magnetic and Optical Performance and Application of the $(\text{BiPrGdYb})_3(\text{FeAl})_5\text{O}_{12}$ Monocrystalline film

Liu Xianglin [0491 3276 2651], Wang Hongxiang [3769 3163 4382], Ruan Yuanji [70860337 4921] and Zhu Zhengzhong [2612 2973 1813] (Shanghai Metallurgy Institute of the Chinese Academy of Sciences)

The  $O_p/d$  of the  $(\text{BiPrGdYb})_2(\text{FeAl})_5\text{O}_{12}$  monocrystalline film at 6328A reached 3.69 to 4.05°. It has already been used in light modulation.

#### The Lithium Niobate Transverse Electro-Optic Modulator

Fang Zheng [2455 2973] et al (Shanghai City Laser Technology Research Institute)

This article introduced the design and the experimental results of the lithium niobate transverse electro-optic modulator. Because consideration was given to appropriate structure and processing technology, superior low-drive electrical voltage and high extinction ratio characteristics were obtained. It was tested by a He-Ne laser of 1.5 milliwatts at an angle of divergence of 1.5 milliradians. The half wave voltage of the monocrystalline lithium niobate modulator was 360 volts. The extinction ratio reached 800:1. The half wave voltage of the double crystalline chip lithium niobate modulator was 180 volts, and the extinction ratio reached 500:1.

#### Optical Anisotropy of the $\text{BeAl}_2\text{O}_4:\text{Cr}^{3+}$ Monocrystal

Wu Guangzhao [0702 0342 3564] and Zhang Xiurong [1728 4423 2837] (Shanghai Optics and Precision Instruments Institute of the Chinese Academy of Sciences) Group theory and the tensor operator were used to discuss the energy levels and optical anisotropy of the  $\text{BeAl}_2\text{O}_4:\text{Cr}^{3+}$  laser crystal.

#### Development of the Lead Molybdate Acousto-Optic Modulator

Hua Wangxiang [5478 3769 4382], Bian Huian [0593 1979 1344] and Tan Haoran [6223 3185 3544] (Shanghai Silicates Institute of the Chinese Academy of Sciences)

This article separately introduced the operating principle of the lead molybdate acousto-optic modulator, the design of the device and the technological process, and at the same time, it tested the performance of the lead molybdate acousto-optic modulator.

#### The $\text{LiNbO}_3$ -ZF Glass Acousto-Optic Modulator

Fang Zheng [2455 2973] et al (Shanghai City Laser Technology Research Institute)

This article introduced the design of the acousto-optic modulator using ZF glass as the acousto-optic medium and the  $36^\circ\text{Y}$  cut  $\text{LiNbO}_3$  crystalline chip<sup>6</sup> as the electro-acoustic transducer, and proposed a method to improve the diffraction efficiency and lower the driving power. Satisfactory results were obtained.

#### The Use of an Acousto-Optic Servo Control System To Stabilize the Output of an He-Cd Laser

Lu Jianhua [0712 1696 5478], Jiang Jialin [5592 1367 7792] and Zhu Sanyou [2612 0005 0642] (Shanghai City Laser Technology Research Institute)

This article described the use of an acousto-optic modulator controlled by an electron servo system as a light feedback to stabilize the power of the He-Cd laser and to lower noise. It could also serve to isolate light. Its principle is to compensate the intensity of Bragg diffraction by utilizing light feedback in the acousto-optic modulator to reach a stable value. This technique has general significance and could be popularly applied in other types of lasers.

#### Stabilizing Laser Output by Frequency Multiplication To Compensate for Leakage in the Nd:YAG cavity

Lu Jianhua [0712 1696 5478] et al (Shanghai City Laser Technology Research Institute)

This article described the use of frequency multiplication in the  $\text{Ba Na}(\text{NbO}_3)_5$  (BNN) cavity as a leakage compensation element to stabilize the output of the 1.06-micrometer YAG laser. Comparative tests of the two types of continuous pumping sources of different precision were conducted. After using the scheme of frequency multiplication for compensation and stabilization, the stability of the power visibly improved. The amplitude of the output noise spectra was suppressed, especially the low noise frequencies less than 100 Hz. Experiments also discovered that the matching temperature for frequency multiplication and the compensation element did not have to be very precise. Also, because the power of the second harmonic leakage was very small, the useful power of the 1.06-micrometer laser was not visibly reduced, thus this method could be a practical stabilization method.

#### Study of the Light-Induced Double Refraction Effect in Glass

Deng He [6772 0735], Zhang Meizhen [1728 2734 3791] and Li Chengfu [2621 2052 1381] (Shanghai Optics and Precision Instrument Institute of the Chinese Academy of Sciences)

This article reported on the research results of the light-induced double refraction effect in several types of optical glass and laser glass produced in our nation.

Nonlinear Optical Properties of the Sodium Sulfosalicylate Monocrystal  
Wang Gongming [3769 1872 2494], Jiang Xingmei [1203 2622 2734] and Wang Wencheng [3769 2429 3397] (Physics Department of Fudan University)

This article reported on the method of measuring the refractive index and the nonlinear coefficient of frequency multiplication of the dual axis SN crystal. It gave the three high refractive indices and frequency multiplication coefficients  $d_{31}$  and  $d_{32}$  of the crystal at 0.53 micrometer, 0.63 micrometer and 1.06 micrometer, and an evaluation of the nonlinear optical properties of the SN crystal.

Preliminary Study of the Nonlinearity of the Lead Sulfide (PbS) Detector  
Yang Shao [2799 4801] and Bao Xuecheng [0545 1331 6134] (Shanghai City Testing Technology Research Institute)

This article described the method and the experimental device for testing the nonlinearity of the lead sulfide infrared detector.

Spectral Analysis of MgO:Ni Between 0.35 and 1.5 Micrometers

Zhang Qiren [1728 0796 0088], Fang Peiying [2455 0160 3853], Fang Shugan [2455 2579 3227] and Fang Junxin [2455 0193 9515] (Applied Physics Department of the Shanghai Jiaotong University)

This article reported on the results of measurement and analysis of the absorption spectrum and the emission spectrum of MgO:Ni<sup>2+</sup> multicrystalline samples in the range from 0.35 to 1.5 micrometers.

Automatic Gate Opening Phenomenon by Green Light in the Optical Kerr Cell Polarization Switch

Gao Fuyuan [7559 4395 3293], Wang Wenyao [3769 2429 5067] et al (Shanghai Optics and Precision Instruments Institute of the Chinese Academy of Sciences)

This article reported on the phenomenon of automatic gate opening by green light in the optical Kerr cell polarization switch and preliminarily analyzed the cause of this phenomenon.

Photoelectric Switch with Micromicrosecond Precision and Its Application

Chen Lanrong [7115 5695 2837], Zhu Xinming [2612 9515 6900], Zhi Tingting [2388 1250 1250], Zhu Xiaochun [2612 1420 2504], Cao Gengdi [2580 2704 1229] and Wang Nailong [3769 3189 7893] (Shanghai Optics and Precision Instruments Institute of the Chinese Academy of Sciences)

The 1.06 micrometer Nd:YAG passive locked mode laser and the single 0.53-micrometer ultrashort light pulse after frequency multiplication were used separately to irradiate GaAs of a high resistance. Submillimicrosecond electrical pulses having a highly synchronous precision as the locked mode laser were obtained. The amplitude was 1 kilovolt, the pulse width was smaller than the time resolution limits of the Tektronix 7904 oscilloscope.



#### Automatic Control of Bias of the Electro-Optic Modulator

Weng Wenquan [5040 2429 3123] and Chen Xiliang [7115 1873 5238] (Shanghai City Laser Technology Research Institute)

This article briefly described the principle of automatic control of bias when the working point of the electro-optic modulator was selected as the trough (or peak) of the sine squared curve. A positive and a negative pulse of equal magnitude but opposite in direction were added to the electro-optic modulator. If the operating point drifted, the two corresponding output pulses of the electro-optic modulator were no longer equal and they could be controlled by regulating their difference value.

This article proposed a scheme for automatic control of bias. Satisfactory experimental results were obtained using this scheme. The drift was reduced by more than 30 times, thus the problem of stable operation of the electro-optic modulator over a long duration was solved.

#### Holographic and Film Technologies

##### Using the Fresnel Lens To Produce a Three-Dimensional Display of a One-Step Primary Rainbow Hologram

Chen Shanhua [7115 0810 5478], Yao Wenhua [1202 2429 5478] and Jia Yurun [6328 3768 3387] (Fudan University)

This article reported on the use of the Fresnel lens to photograph a one-step rainbow hologram. White light could display the three-dimensional holographic image of an object at an angle of observation of  $50^\circ$ .

##### Quantitative Analysis of the Amplitude of Vibration of the Violin Bridge Using the Method of Frequency Flash Holographic Interference

Bao Naikeng [7637 0035 6972] and Ding Zuquan [0002 4371 3123] (Structural Theory Research Institute of Tongji University)

Wang Ming [3769 6900] and Zhu Shuilin [2612 3055 2651] (Electrical Engineering Department of Tongji University)

This article proposed a new method of quantitative analysis of the three-dimensional amplitude of vibration by combining the method of frequency flash holographic interference of a single sheet hologram and a three-dimensional holographic pattern reader developed by us in recent years. Experiments in quantitative analysis of the amplitude of vibration of a high-quality violin bridge showed that the method described can be suitably used in different fields for noncontact type quantitative analysis of vibration in product quality control, expansion of cracks due to structural fatigue, and bioengineering.

##### A Real-Time Density Detector for Developing Holographic Negatives

Optics Group of the Physics Laboratory of Tongji University

This article presented a device which could detect the density of developing holographic negatives in real-time. Thus, the density of developing holographic negatives could be better controlled and a higher diffraction efficiency of various holograms could be assured.

##### Development of a Stepped Plate of Equal Differential of 20 Levels and Parameters of the Tianjin Holographic Negative

Chen Ruifen [7115 1920 5358] and Zhang Zhiming [4545 1807 7686] (Fudan

University); Yu Chongxiu [0151 6850 4423] (Beijing Postal and Telecommunications Academy)

This article reported on a method of developing a stepped plate of equal differential of 20 levels with a density range of  $D=4$ . The stepped plate was used to measure the parameters of domestically produced holographic negatives, and satisfactory results were obtained.

Selection of a Method To Correct and Calculate the Phase Error of Holograms  
Zhen Hui [6774 6540] (Shanghai Optics and Precision Instruments Institute of the Chinese Academy of Sciences)

This article used the results of correct practices and mistakes to explain the necessity and theoretical basis for selecting the method for correcting phase errors of Lohmann holograms.

Using Heavy Chromate Gelatin Plates with Increased Sensitivity to Red Light To Record the Lipmann Hologram

Qu Zhimin [2575 1807 2404], Cai Xueqiang [5591 7185 1730], Xu Yingming [1776 5391 2494] and Li Meiyue [2621 5019 1588] (Shanghai City Laser Technology Research Institute)

This article reported on the use of methene blue as the sensitizer to increase the sensitivity of a heavy chromate gelatin plate to red light, described the preparation for sensitizing the gelatin plate and the experimental method of treatment. The red light from a He-Ne laser was used to photograph the holographic grating. A diffraction efficiency of 84 percent was obtained. At the same time, a Lipmann hologram which could be reproduced by white light was made. This was an experimental preparation for colored reproduction with white light.

Computer Generated Holograph: Checking the "Zero" of the Nonspherical Wavefront

Chen Zhongyu [7]5 0112 5940] and Zheng Hui [6774 6540] (Shanghai Optics and Precision Instruments Institute of the Chinese Academy of Sciences); Zhuang Yilin [8369 0076 7792] (Shanghai City Laser Technology Research Institute)

This article introduced the use of a computer generated hologram as a model for checking the "zero" of the nonspherical wavefront. The precision could reach

Third Order Aberration of the Rainbow Hologram and the Effect of upon Magnification and Third Order Aberration

Zhang Youwen [1728 1635 2429] and Zhu Weiguang [2612 0251 0342] (Shanghai Jiaotong University; Xing Yingjie [6717 5391 2638] (Beijing Industrial University)

This article discussed the third order aberration of the rainbow hologram and the effect of  $\Delta\lambda_2$  upon magnification and third order aberration. Through discussion, we could select the parameters to eliminate or reduce certain aberrations and improve the quality of the image. The has both practical and theoretical significance.

Cruciform Slit Rainbow Hologram

Zhang Youwen [1728 1635 2429] and Zhu Weiguang [2612 0251 0342] (Shanghai Jiaotong University)

To overcome the shortcomings of a loss of vertical parallax of the single slit rainbow hologram, this article reported on the cruciform slit rainbow hologram produced by Zhang Li [1728 4539] et al under the guidance of Professor Yang Zhenhuan [2799 2182 1403] in the United States. The cruciform slit rainbow hologram could also create the rainbow in the vertical and horizontal directions, and new applications in interferometry are hoped for.

**Analysis of the Spatial Frequency Bandwidth of the Single Slit Rainbow Hologram**  
Zhang Youwen [1728 1635 2429] and Zhu Weiguang [2612 5391 2638] (Shanghai Jiaotong University); Cai Luzhong [5591 1462 0022] (Shandong University)  
The spatial frequency bandwidth of a hologram is limited by the effective aperture of the hologram. Analysis of resolution and chromatic ambiguity of the single slit rainbow hologram in this article showed that discussion of the spatial frequency required only a one-dimensional treatment.

**Light Absorption Coefficient of an Extended Membrane of Magnetic Garnet**  
Wang Lixuan [3769 4539 5503] and Wang Yaqu [3769 0068 2475] (Shanghai Metallurgy Institute of the Chinese Academy of Sciences)  
This article proposed an expression for calculating the light absorption coefficient of a thin membrane under the effects of background absorption, multiple reflections by the membrane layers and interference.

**Unbacked Monocrystalline Gold Membrane**  
Yu Ying [6735 3841], Wan Xinnong [8001 2450 6593], Li Yuanyuan [2621 0337 0948] and Shen Yuanhua [3088 0337 5478] (Fudan University)  
This article introduced the device and the method of using allomeric extension to plate a monocrystal with a gold membrane in vacuum. Mica was used as the base board and a specific heating device and optical measurement of thickness were used to obtain an Ag membrane of known thickness and an Au membrane. Then, an unbacked (111) monocrystalline gold membrane of about 500Å in thickness was obtained by corrosion.

**Properties of the Titanium Dioxide Membrane and Its Application in a Laser**  
Peng Jiaju [1756 1367 7467] (Shanghai City Laser Technology Research Institute)  
This article reported on the properties of the titanium dioxide membrane and the results of its application in a laser. Practice proved it was superior to similar types of soft membranes.

**Detection and Reduction of Oil Vapors in the Membrane Plating Vacuum Chamber**  
Xing Zhongjing [6717 0022 5464], Wan Xinnong [8001 2450 6593], Yu Ying [6735 3841], Xu Xinmin [1776 2450 3046] and Shen Yuanhua [3088 0337 5478] (Fudan University)  
This article described the effective detection of the presence of oil vapor in the vacuum chamber using a simple electron gun and a nickel target made by ourselves according to the principle that the secondary emission coefficient of a metal and the pollution of its surface are sensitively related. It also proved that the oil vapor in the membrane plating vacuum chamber came mainly from the mechanical pump. We added a molecular sift oil suction well made by ourselves at the intake of the mechanical pump and effectively reduced the backward flow of oil.

## Testing Technology

### Use of the Seeman Double Frequency Laser To Measure the Number of Revolutions and To Position Angles

Lin Qingbo [2651 7230 2672] (Shanghai City Laser Technology Research Institute)

This article introduced the use of the Seeman double frequency laser to measure the number of revolutions of a rotating body. Its precision can be better than  $1 \times 10^{-5}$ . The precision of positioning angles can reach  $\Delta\alpha = +5'$ . This method is similarly suitable for measuring the dynamic torsional deformation of large shafts and it is especially suitable for measuring high speeds of rotation (several hundred thousand revolutions/minute).

### A Laser Beam Excited Microscopic Fluorimeter Made by Ourselves--To Measure the Sideways Movement of Albumen on Cell Surfaces

Sun Weili [1327 0251 0448], Zhang Konghua [1728 1313 5478] and Zhang Boxin [1728 0130 2450] (Shanghai Cytobiology Institute of the Chinese Academy of Sciences)

This work was aimed at developing a set of instruments for quantitative measurement of sideways expansion movements of albumen molecules on cell surfaces--the laser beam excited microscopic fluorimeter to study the vitality of cells. We used this device to measure the sideways expansion coefficient of the concanavalin globulin acceptor on the surface of a tumor cell.

### A Digital Thermoelectric Effect Laser Pulse Energy Meter

Zhu Qing [2612 2532] (Shanghai First Syringe Plant)

This article introduced a unique digital laser pulse radiation energy meter utilizing the characteristics of distributed electrical capacitance of a large area PZT thermoelectric device. The electronic circuits were simple, reliable and easy to integrate and miniaturize. The meter is suitable for use in quick measurements of the energy of medium and large power short pulsed lasers.

### The Principle and Application of a Method of Difference Frequency Interference Phase Measurements by Laser

Zhu Qing [2612 2532] (Shanghai First Syringe Plant)

This article described the principle of a new method of dynamic information reception and processing using laser interference. It also reported the success of using this principle in measuring the parameters of the diameter of a thin optical fiber in high-speed motion. At the same time, it proposed several ideas of application in other fields.

### Thermoelectric Detector and Its Application

Wang Keqin [3769 0344 0530], Chen Renliang [7115 0088 5328], Xiao Minqiang [5135 3046 1730], Li Hailun [2621 3189 0178] and Zhou Songdi [0719 2646 1229] (Shanghai City Laser Technology Research Institute)

We successfully developed a  $\text{CO}_2$  thermoelectric detector. We used the detector's receiving element to scan the cross-section of a light beam of a continuous  $\text{CO}_2$  laser. The output signal of the thermoelectric detector was recorded by a recorder. Thus, the intensity distribution of light could be measured, and from this, the dimension of the light spot and the angle of divergence and such laser parameters could be calculated. This article described the results



of testing the parameters of the CO<sub>2</sub> laser, and the experimental results were subjected to analysis.

**The Cause of Errors in the Deflector of a Laser Flow Detector and Counter-measures**

Xu Huiren [1776 1920 0088] and Gu Peide [7357 1014 1795] (Shanghai City Laser Technology Research Institute)

This article discussed the cause of error produced by the resonance mirrors, and in particular the linearity, repeatability, lag and temperature drift. To improve the performance of the resonance mirrors, we used corresponding countermeasures. The article concentrated on a discussion of the closed loop circuit, the sensor circuit and the thermostat circuit of the resonance mirrors.

**Measurement of Faraday Rotation in a Garnet Monocrystalline Membrane**

Feng Jingzhang [1409 2417 3864], Ruan Yuanji [7086 0337 4921] and Zhu Zhengzhong [2612 2973 0022] (Shanghai Metallurgy Institute of the Chinese Academy of Sciences)

A magneto-optic modulator was used to measure the Faraday rotation of a garnet monocrystalline membrane. The measuring system was simple, versatile, its reading precision was  $\pm 0.005^\circ$  and its error was  $\leq 5$  percent.

**Study of an Experimental Method of Using a Laser to Measure the Instantaneous Velocity of a Rotating Shaft**

Liu Yingchun [0491 2019 2504] (Optical Measurement Group of the 711 Research Institute)

This article introduced the use of scattered laser spots and Doppler frequency shift techniques to measure the instantaneous velocity of a rotating shaft and analyzed the experimental data.

**Using a Microwave Interferometer To Measure the Density of Electrons in a Gas Discharge Tube**

Wang Yuzhi [3769 3768 5347] (Shanghai Optics and Precision Instruments Institute of the Chinese Academy of Sciences)

This article described the use of a 3-centimeter waveband microwave interferometer to measure the density of electrons in a gas discharge tube, studied the discharge current, pressure of the gas, and the effects of additional mixtures of various gases upon the density of electrons.

**Use of the Bi-Photon Fluorescence Method To Determine the Temporal Synchronism of Six Laser Beams**

Yu Wenyan [0151 2429 3508], Xie Ziming [6200 2737 6900], Li Anmin [2621 1344 3046] et al (Shanghai Optics and Precision Instruments Institute of the Chinese Academy of Sciences)

The bi-photon fluorescence method was used to measure the temporal synchronism of six high-power rubidium glass laser systems ( $6 \times 10^{11}$  watts). The error in synchronism was 10 micromicroseconds.

**New Application of the Twyman-Green Interferometer in Inspecting Solid Laser Materials**

Li Xishan [2621 6932 0810], Jiang Anmin [5592 1344 3046] and Xia Qingsheng

[1115 7230 3932] (Shanghai Optics and Precision Instruments Institute of the Chinese Academy of Sciences)

This article discussed conditions for a simultaneous solution of the reflective and transmissive interference equations of the sample examined by the Twyman-Green interferometer and applications of the equations.

#### The Main Measuring System of the National Standard Rockwell Hardness Meter Using a Laser

Chen Mingyi [7115 2494 0308] and Sun Guiqing [1327 2710 3237] (Shanghai Science and Technology University)

This article introduced the operating principle of the main measuring system of the national standard Rockwell hardness meter using a laser, described several characteristics in the design of that system, and finally analyzed and calculated the error of the main measuring system using a laser.

#### Calculation of the Phase Matching Angle in Frequency Multiplication of Double Axis Crystals and the Effective Nonlinear Coefficient

Xie Shengwu [6200 4939 2976] (Applied Physics Department of the Shanghai Jiatong University)

This article derived the computational formulas of  $d_{\text{eff}}^{\text{I}}$ ,  $d_{\text{eff}}^{\text{II}}$  of double axis crystals of five types of point lattices including the monoclinic  $m$  and the triclinic  $1$  on the basis of the principle of phase matching in the double axis crystal, compiled two source programs which can be executed on the DJS-6 computer for calculating the phase matching angle in frequency multiplication and the effective nonlinear coefficients. It also performed calculations for eight types of double axis crystals including lithium methanoic acid monohydrate and sodium barium niobate and gave the computational results. It also showed that test results of phase matching in frequency multiplication using lithium methanoic acid monohydrate and barium niobate were consistent with the computational results.

#### Determination of $f_s$ of a Piezoelectric Transducer in Body Wave Acousto-Optic Devices

Sun Zongjian [1327 1350 0256] (Physics Department of Tongji University)

The operating frequency of a piezoelectric transducer of a body wave acousto-optic device must be selected above the device's series resonance frequency  $f_s$ . This article gave the method of determining the  $f_s$  of the transducer and pointed out its meaning.

#### Laser Applications

##### A Laser Doppler Rhysimeter Whose Direction Can Be Fixed

Tank Kaiyuan [0781 7030 0337], Xu Xunming [6079 2485 6900], Zhang Zidong [1728 5261 2767] and Sun Yusheng [1327 3254 3932] (Shanghai City Laser Technology Research Institute)

This article introduced a Doppler rhysimeter which can recognize the direction of flow and which is now successfully operating in a laboratory. The device measured a small water hole and traced the changes in the speed of flow of a fluid and recognized the direction of the flow velocity in a versatile manner. The article gave the results of measurements, and analyzed and discussed the results.

#### Application of the Laser Theodolite in the Installation of a Lightweight Aluminum Mast

Ye Renyue [5509 0088 1471] (Shanghai Qiuxin Shipbuilding Yard)

A laser theodolite was used for collimation and the method of left and right angle division was used to solve the difficulty of installing a lightweight aluminum mast on ships because it bends easily.

#### Use of the YAG Acousto-Optic Modulating Q-Switched Laser To Adjust Electrical Resistance

Chen Shizhen [7120 0013 2823], Shen Zhendong [3088 2182 2639], Li Fujin [2621 4395 6855], Wu Dongfeng [0702 2639 7364] and Wei Jieyun [7416 3381 0061] (Shanghai City Laser Technology Research Institute)

This article comprehensively described the devices and principles of the optical system of a YAG acousto-optic Q-switched laser for microscopic adjustment of thick and thin membrane circuits. It described the advantages of using a laser to adjust resistance and gave several parameters of the technique and several parameters that affect the precision of adjusting resistance by a laser. Two cases of using a laser to adjust resistance were given.

#### Holographic Nondestructive Inspection of Thin Walled Metallic Cylinders

Gu Huizhen [7357 1920 3791] and Li Mingheng [2621 0682 3801] (Shanghai Centrifugal Machinery Research Institute)

This article introduced the preliminary results of using holographic nondestructive inspection to examine damage in a thin walled metallic cylinder.

#### Laser Operated Horizontal Drift Meter for the Inertial Guidance Platform

Ye Tianmin [5509 1131 3046] (Shanghai Navigational Instruments Plant)

The laser operated horizontal drift meter for the inertial guidance platform was used to measure the relative stationary and dynamic horizontal precision of the navigational inertial guidance platform. This article introduced the characteristics, the operating principles and the precision of this instrument.

#### Matrix Laser Tracer

Zhong Junyi [6945 0193 5030] (Shanghai Xinyao Instruments Plant)

This article introduced a type of matrix laser tracer. It operates in a relay sliding linear state. Signal control requires only consideration of the phase information of the light spot incident upon the laser detector, and consideration need not be given to the absolute distance of the reflection of the light spot from the center of the detector. Such a treatment of the laser signal can utilize the wave clipping technique to eliminate noise interference in amplitude modulation. An integrated digital circuit is used to process the information and thus the design is simple and reliable.

#### Comparison of Two Types of Laser Direction Finders

Zhong Junyi [6945 0193 5030] (Shanghai Xinyao Instruments Plant)

This article compared the parametric expressions for the disk shaped light spot and the ring shaped light spot formed by the laser image of the target on the detector and the parametric expressions of laser signals emitted by a four-quadrant tube detector installed horizontally and at an angle of  $45^\circ$ .

The article also discussed the two methods of direction finding by laser—sum and difference circuit method (i.e., horizontal installation of the detector) and diagonal subtraction method (i.e., installation of the detector at a 45° angle).

#### Laser in Medical Science

##### Studying the Use of a Carbon Dioxide Laser in an Experiment To Vaporize Cancerous Nodes in the Liver

Wang Dezhaoh [3769 1795 2507] and Li Yongfang [2621 3057 2455] (Surgery Teaching and Research Laboratory of Huashan Hospital of the First Shanghai Medical College)

This article studied the effectiveness of using a 10.6-micrometer laser to vaporize cancer of the liver. It also described the observations made in the experiment to vaporize butter salt induced and transplanted cancerous nodes in the liver of large mice. The experiment proved that continuous measurement of the concentration of the AFP serum can serve as data for estimating the effectiveness of vaporization of cellular cancer of the liver of positive AFP. At the same time, it explored the limitations of using a laser to vaporize cancer of the liver.

##### Preliminary Observations of the Surgical Incision Made by an Isotopic Colloidal Gold Tagged CO<sub>2</sub> Laser Scalpel

Yu Chibing [0060 6375 0365] (Changzheng Hospital of the Second Military Medical University)

To explore whether the lymphangion can be sealed after surgery by CO<sub>2</sub> laser and to prevent lymphatic drainage, we operated on patients in five cases using the CO<sub>2</sub> laser scalpel. During the operation, an isotopic colloidal gold tag was used to tag the incision and preliminary observations were made.

##### Effects of Irradiation of the Sacrococcygeal by a Helium-Neon Laser upon the Function and Shape of the Ovary and upon Reproduction

Ding Aihua [0002 1947 5478] et al (Gynaecology and Obstetrics Hospital of the First Shanghai Medical College)

Chen Huiling [7115 2910 3781] et al (Physiology Institute of the Chinese Academy of Sciences)

Wang Da [3769 6671] et al (Cytology Institute of the Chinese Academy of Sciences)

This article described the safety problems in the use of a helium-neon laser for localized irradiation or treatment by irradiation of acupuncture points. It also described clinical observations and analogical experiments of the effects of laser irradiation upon the functions of the ovary of barren patients due to inflammation of the appendages and the effects upon the shape and reproductive ability of the ovaries of animals. It pointed out that the effective dosage of the helium-neon laser used for treatment at present is within the safety range and would not cause pathological effects.

##### Effects of Irradiation of the Sacrococcygeal by a Helium-Neon Laser upon the Rate of Blood Flow and the Permeability of Blood Capillaries of the Domesticated Rabbit

Ding Aihua [0002 1947 5478] et al (Gynaecology and Obstetrics Hospital of the



First Shanghai Medical College)

Jin Huiming [6855 2910 6900] et al (Pathological Health Teaching and Research Group of the First Shanghai Medical College)

This article was based on the belief that the effectiveness of clinical treatment of inflammation of the appendages using the helium-neon laser might be related to the improvement of circulation in the capillary regions. The article discussed the possible mechanism of treating inflammation of the appendages by localized irradiation of the sacrococcygeal using a helium-neon laser based on the experiment of the effect of a laser upon the rate of blood flow and permeability of the capillaries of the domesticated rabbit.

Study of the Absorption Spectrum of Cancer Cells of the Human Body

Laser Medicine Research Laboratory of the First Shanghai Medical College

In the laser treatment of tumors, one must first understand the absorption spectrum of the tumor tissue before one can select a matching wavelength according to the tumor tissue's own spectral characteristics to realize better results in treatment. Therefore, analysis of the spectra of different tumors has an important significance in the use of lasers. This article reported on present research efforts in spectral analysis of human cancer cells.

Preliminary Observation of the Sensitivity of ARS Sarcoma and Ehrlich Ascitic Cancer Cells to Certain Spectral Lines and the Effects of Suppression Caused by a Tunable Dye Laser

Yang Fushou [2799 4395 1108] (Shanghai Seamen's Hospital)

Wang Quida [3769 3809 6671] (Shanghai Cell Biology Institute of the Chinese Academy of Sciences)

Xu Dawen [1776 6671 2429] and Li Fengying [2621 7685 5391] (Shanghai City Laser Technology Research Institute)

Ren Yunfeng [0117 0061 1496] (Shanghai Materia Medica Institute of the Chinese Academy of Sciences)

This article described the growth, suppression and change in shape of ARS sarcoma cells and Ehrlich's ascitic cancer cells irradiated by a tunable dye laser (4727 to 5365Å), and the discovery that the above cells are particularly sensitive to certain spectral lines.

Preliminary

Liu Demin [0491 1795 3046] et al (Laser Medicine Research Laboratory of the First Shanghai Medical College)

Yang Fushou [2799 4395 1108] (Shanghai Seamen's Hospital)

Chen Zhaoping [7115 0340 1627], Zhou Yiping [0719 2011 5493] et al (Department of Otolaryngological and Ophthalmological Examinations of the First Shanghai Medical College)

Qu Zhipu [2575 1807 3940] et al (Shanghai City Laser Technology Research Institute)

To theoretically explore the mechanism of the effect of a laser upon the macromolecules of cancer cells, to guide clinical application and to improve effectiveness of treatment, this article gave a preliminary report on the effects of a laser upon the RNA of cancer cells.

Design and Trial Production of a System To Analyze Mobile Cells by an Argon Laser

Xu Songlin [6079 2646 2651], Pan Jiapu [3382 1367 2528], Shi Guiying [0670 1710 5391], Qian Shuiyun [6929 3055 0061], Zuo Ruipeng [0587 3843 7720] and Qin Jianan [4440 1367 2809] (Second Shanghai Medical College)

An argon laser of a wavelength of 4880Å was focused to irradiate stable but fast moving stained cells, producing cellular fluorescence. A photoelectric multiplier tube was used to convert the cellular fluorescence into electrical signals for data processing. The histograms of DNA variations of the cells expressed in numerical values were displayed or printed out, and statistical characteristics of a massive number of cells were obtained. This article described the principle and structure of each part of this system and gave the experimental results.

#### Preliminary Exploration of the Use of a Helium-Neon Laser Needle to "Create Energy" and Observations of Clinical Treatment

Liu Defu [0491 1795 0265], Xu Jichang [1776 4764 2490], Zhao Huifang [6392 2910 5364], Han Jianjin [7281 0256 6930] and Sun Zhenfeng [1327 2182 7685] (Ruijin Hospital of the Second Shanghai Medical College)

Wan Xinnong [8001 2450 6593] and Chen Gengfu [7115 2704 4395] (Fudan University)

This article introduced the use of a He-Ne laser beam as an acupuncture needle in an experiment to "create energy". When the laser beam irradiates the acupuncture point he gu (LI 4) at 1'30" to 10' (averaging 4 to 5 minutes), an "electrical signal" is obtained at the acupuncture point qu chi (LI 11) on the same meridian. At the same time, no "electrical signal" is detected at the acupuncture point chi ze (L 5) on the irregular meridian. This article introduced the use of the laser needle to irradiate effective acupuncture points to treat primary dysmenorrhoea, reduction of platelets and menorrhagia patients and it described the results of observations before and after irradiation by the laser needle.

#### Observation of the Histological Effects of a YAG Laser Needle upon the Vocal Cord and the Tongue of a Dog

Laser Medicine Research Laboratory of the First Shanghai Medical College  
This laboratory used a 1.06-micrometer YAG laser in an optically coupled system using a single filament quartz optical fiber to irradiate the vocal cord and the tongue of a dog and to observe instantaneous changes in the tissues caused by different laser doses and changes after healing.

#### Brief Summary of the Use of an Argon Laser To Irradiate Acupuncture Points in the Treatment of Diseases of the Digestive Tract

Hu Ronghua [5170 5554 5478] (Yueyang Hospital)

#### Preliminary Clinical Observation of the Use of CO<sub>2</sub> Laser Irradiation and Supplementary Medication of Chinese Medicinal Herbs To Treat "Hepatocirrhotic Ascites"

Mao Dingbo [5403 1353 3134], Yang Bingkui [2799 3521 1145], Xu Yongyuan [1776 3057 0337], Tang Weiyan [0781 4850 2266], Zhang Xingying [1728 2622 5391] and Zhang Zonghu [1728 1504 5706] (Jiading County Central Hospital)

"Chronic hepatocirrhotic ascites" of porta vena is a frequently seen chronic disease. Since the beginning of this year, we have used an expanded CO<sub>2</sub> laser beam to irradiate patients in 20 cases of chronic hepatocirrhotic ascites and

supplemented the treatment with Chinese herbal medicine to rejuvenate the blood. Satisfactory results were obtained.

#### Preliminary Results of Using a CO<sub>2</sub> Laser To Treat Silicosis

Laser Laboratory of the Third People's Hospital of the Second Shanghai Medical College  
Vocational Diseases Research Institute of the Shanghai Metallurgy Bureau  
Laser Laboratory of the Second Shanghai Medical College

This article reported on 13 cases of silicosis patients treated by carbon dioxide laser irradiation with a power density of 113 mW/cm<sup>2</sup>. The laser irradiated an area of the back corresponding to the middle and lower parts of the chest. Irradiation of the right and left sides lasted 10 minutes each, and a total of 36 to 46 irradiation treatments were administered. After exposure, the patients' respiratory tract symptoms improved. The total complement and C<sub>3</sub> increased, but because the duration was short, effectiveness of the treatment still requires continued observation.

#### Preliminary Exploration of the Use of a Helium-Neon Optical Fiber Needle To Treat Bronchial Asthma

Fu Caizhi [0265 6845 5347] (First Hospital of the Shanghai Textile Industry Bureau)

A helium-neon optical fiber needle was used to treat 60 cases of bronchial asthma. Clinical observations were conducted for 2 years. The effectiveness of treatment was visible. Of the cases, 21.6 percent were cured. Treatment was effective in 66.7 percent of the cases, while treatment of 11.7 percent was ineffective.

#### Clinical Application of a Small Power Helium-Neon Laser

Lu Lanyi [0712 5695 0308] (Acupuncture and Moxibustion Department of the Wusong Central Hospital)

#### Clinical Observation of Using a Laser in Artificial Abortion

Hu Shizheng [5170 1102 1767] (First Health Clinic for Women and Infants in Shanghai)

A helium-neon laser was used to irradiate acupuncture points to relax the os uteri and to suppress pain during artificial abortion. The percentage of relaxation reached 86.3 percent and the analgesic rate reached 84.64 percent.

#### Experience in Developing and Applying the Helium-Neon Laser Optical Fiber Needle

Medical Laser Research Laboratory of Huadong Hospital

We have successfully developed a pulsed laser needle to explore the effects of a pulsed laser needle in medical treatment. It is being clinically tested. The laser output is 2 milliwatts. After converting the power to pulsed energy between frequencies of 1 and 10 Hz, the peak value power can reach 10 to 30 milliwatts. The frequency of the laser can reach 1 to 200 Hz. Its peak value power under various frequencies and its depth of penetration into tissue is being measured.

Measurement of the Fluorescent Spectra of Stomach Cancer Irradiated by Laser  
Laser Research Laboratory of the Physics Department of Fudan University  
Shanghai Medical Instruments Research Institute  
Department of Tumors of the Central Hospital of the Changning Ward of Shanghai City

The fluorescent spectrum of stomach cancer excited by a nitrogen laser was measured. It was discovered that besides the normal fluorescent peak, stomach cancer had a characteristic peak near 6000Å. The experiment showed the possibility of future use of a laser to produce fluorescence in the diagnosis of stomach cancer.

Clinical Application of an Argon Ion Laser Optical Fiber  
Laser Medicine Research Laboratory of the First Shanghai Medical College  
This article reported on an Ar laser optical fiber device successfully developed by our laboratory, the Yaming Light Bulb Plant and the Xinhua Glass Plant. The device was used clinically on the basis of animal experiments, and definite results were achieved. It was particularly effective in treating diseases of the vascular system.

Laser Irradiation To Treat Common Diseases of the Vocal Cords  
Laser Medicine Research Laboratory of the First Shanghai Medical College  
We used He-Ne laser irradiation and CO<sub>2</sub> laser irradiation on a trial basis to treat common diseases of the vocal cords, vocal cord polypus, chronic laryngitis and vocal nodules, and obtained improvement.

The He-Ne Optical Fiber Light Guide Used To Treat Chronic Pharyngitis  
Lu Junan [4151 0193 1344], Jiang Haoming [5592 3185 2494], Guan Ruzhen [7070 1172 6297] and Ding Zuxing [0002 4371 5281] (Central Hospital of the Wusong Ward)

Chronic pharyngitis is a common disease. This article introduced the use of a He-Ne laser optical fiber light guide to directly irradiate the pharynx of patients. Forty-three different types of cases were selected, and satisfactory treatment was realized.

CO<sub>2</sub> Laser Treatment of 36 Cases of Pathological Changes of the Nasal Septum  
Fang Shuyou [2455 2885 0147] (No 85 Hospital of the Chinese People's Liberation Army)

This article introduced the use of a 30-watt CO<sub>2</sub> laser by our hospital in treating 36 cases of pathological changes of the nasal septum. Good results were obtained.

CO<sub>2</sub> Laser Used To Treat Chronic Hypertrophic Rhinitis  
Laser Medicine Research Laboratory of the First Shanghai Medical College  
Those cases in which all methods of treatment were ineffective, including high-voltage coagulation, freezing operation and partial lower turbinectomy were selected for lower turbinal coagulation using a CO<sub>2</sub> laser.

Helium-Neon Laser Used To Treat Nervous Hearing Difficulty  
Zhang Yifan [1728 0001 1581], Wang Yi [3769 1473] and Pan Zheng [3382 2398] (Laser Laboratory of the Shanghai Seamen's Hospital)  
This article introduced the use of a helium-neon laser in acupuncture treatment



of nervous hearing difficulties. Hearing ability was improved and signs of recovery emerged within a short period (one course of treatment).

Safety and Protection Problems in Medical Treatment by Laser

Guan Zong'an [7070 1504 2429] (Outpatient Department of the Shanghai Optics and Precision Instruments Institute of the Chinese Academy of Sciences)

This article discussed eye damage caused by "reflected light from the light spot of the laser target" and other problems in prevention.

Application of a Laser in Otolaryngology

Laser Laboratory of the Shanghai Seamen's Hospital

This article reported on treatment administered by our hospital using a laser in the otolaryngology department.

Preliminary Exploration of the Clinical Application of a Helium-Neon Laser Needle in Psychiatry

General Psychosis Prevention Hospital of Shanghai City

Shanghai Medical Instruments Research Institute

This article introduced exploratory efforts in using a laser needle to irradiate acupuncture points to treat psychosis. Some preliminary experience has been accumulated.

Report of the Use of a Laser To Irradiate Acupuncture Points To Treat Functional Disorders of the Temple and Chin Joints

Xie Ruiying [6200 1878 7299] (Wusong Central Hospital in Shanghai City)

Use of an Nd<sup>3+</sup>:YAG Laser To Treat Pharyngolaryngeal Cavernous Angioma

Meng Zhaohe [1322 2507 0735] and Lu Baonan [5713 1405 0589] (Xinhua Hospital of the Second Shanghai Medical College)

Ma Baozhang [7456 1405 4545] (Ninth People's Hospital of the Second Shanghai Medical College)

This article reported on the treatment of three cases of pharyngolaryngeal cavernous megalohaemangioma using an Nd<sup>3+</sup>:YAG laser. The output power was 20 to 24 watts. The laser was used to scan and irradiate spots on the tumor. After irradiation, the angioma visibly shrank. Reaction of oedema of the larynx and pain of the pharynx were slight. Tracheotomy was not performed in two cases and treatment was satisfactory. This article also gave a preliminary discussion of the principle, method, reactions and advantages of such treatment.

Use of a Ruby Laser To Treat Gum Tumors

Xu Yigeng [6079 5030 1649], Gong Weizhen [7895 4850 2182] and Cheng Lizheng [4453 7787 1767] (Shanghai City Huangpu Central Hospital)

This article reported on the use of a pulsed ruby laser and on the characteristics of energy absorption by the tissue after the occurrence of albumen coagulation in the tissue in irradiating gum tumors (vascular) by laser iridectomy. Satisfactory results were obtained.

The Use of a Carbon Dioxide Laser To Treat 41 Cases of Oral Mucous Cyst

Yao Yi [1202 5030] et al (Shanghai City Fengxian Fengcheng Hospital)

This article reported on the thermal effect of a CO<sub>2</sub> laser used to cauterize

a cyst and to carbonize it and eliminate it. Statistical comparison and analysis were conducted for 41 cases.

**Clinical Observation of the Use of a He-Ne Laser To Treat Oral Diseases**  
Li Xuexiang [2621 1331 4382] and Ye Meiyun [5509 5019 1750] (Stomatology Teaching and Research Laboratory of the First Shanghai Medical College)  
This article reported on the use of a He-Ne laser (25 milliwatts) to irradiate over 10 types of oral diseases totaling 320 cases. After 2 to 3 years of followup visits, some types of diseases were effectively treated. Some still required further observation for indications.

**The Use of Argon Laser To Treat Periphlebitis of the Retina**  
Wang Kangsun [3769 1660 1327], Wei Yuehua [7614 2588 5478], Zhang Mingheng [1728 2494 3801], Shi Xianghe [2457 7449 5440], Shi Haiyun [4258 3189 0061] and Chen Gangqiang [7115 0474 1730] (Department of Ophthalmology of Ruijin Hospital of the Second Shanghai Medical College)  
This article reported on the use of an argon laser to treat 19 cases of periphlebitis of the retina totaling 22 eyes. After treatment, atrophy of newly grown blood vessels and capillary tumors occurred, and hemorrhage did not occur again in all cases. After treatment, 12 eyes improved in eyesight and 10 eyes did not improve. Eyesight did not worsen in any case. There were 17 eyes that retained their original eyesight or improved their eyesight to over 1.0.

**Clinical Application of the Laser Slit Lamp Microscope for Ophthalmological Treatment**  
Department of Ophthalmology of the Sixth People's Hospital in Shanghai City  
This article introduced the successful installation of a ruby laser on a YZ-5A model slit lamp microscope so that both used the same light axis. This combined device can be used for iridectomy, sealing retinal splits, and it can also coagulate the fluorescent leakage point by fluorescein radiography of the blood at the bottom of the eye. This device serves many purposes and will be applied in clinical practice.

**Split Retina and Treatment by Argon Laser**  
Shi Xianghe [2457 7449 5440], Wang Kangsun [3769 1660 1327], Wei Yuehua [7614 2588 5478], Zhang Mingheng [1728 2494 3801], Shi Haiyun [4258 3189 0061] and Chen Gangqiang [7115 0474 1730] (Ophthalmology Department of Ruijin Hospital of the Second Shanghai Medical College)  
This article reported on the use of the argon laser to coagulate the surrounding border of a split and the normal part of a retina so that a scar dam is formed around the lesion to prevent development of pathological change. Satisfactory results were basically realized.

**Exploring the Mechanism of the Treatment of Ulcers by Irradiation from a CO<sub>2</sub> Laser and a He-Ne Laser.**  
Ni Shenyang [0242 4141 3841], Jiang Haoming [5592 3185 2494], Zhu Zhongfu [2612 0112 0265], Xu Zhichu [6079 0037 0443] and Xu Meizhen [1776 5019 3791] (Central Hospital of the Wusong Ward in Shanghai City)  
This article reported on the application of a low-power CO<sub>2</sub> laser and a He-Ne laser to irradiate and treat chronic ulcers, unhealed wounds from surgery and scars of various causes. All treatments were satisfactory.

#### Application of the Carbon Dioxide Laser in Dermatology

Yao Yi [1202 5030] et al (Shanghai Fengxian and Fengcheng Hospital)

The YYJGA model CO<sub>2</sub> laser was used in clinical treatment of 30 types of dermatosis in more than 800 cases. The article gave the statistical results of 267 cases showing 96.3 percent effectiveness.

#### Brief Summary of Treating 350 Cases of Dermatosis by the CO<sub>2</sub> Laser

Cai Chengsui [5591 6134 4840] and Chen Jinsheng [7115 6855 3932] (Shanghai Postal and Telecommunications Hospital)

This article reported on the use of a CO<sub>2</sub> laser with an output power of 30 watts to irradiate and treat 350 cases of 16 types of common dermatosis, including ordinary warts, melanin moles, haemangioma, clavus, lipotrophic keratinization, fibroma, chronic eczema....Of the cases, 88 percent were cured, 4 percent showed improvement, and treatment of 8 percent was ineffective.

#### The Use of a YAG Laser Fitted with Optical Fiber To Treat Skin Warts

Xu Yigeng [6079 5030 1649], Gong Weizhen [7895 4850 2182] and Zhuang Ruixiang [8369 1878 4382] (Shanghai City Huangpu Central Hospital)

The YAG laser was fitted with a single filament optical fiber and operated with an output power of 5 watts to effectively treat small skin warts.

#### The Use of a Low-Power and Low-Density Laser To Irradiate and Treat 298 Cases

Sun Dongxin [1327 2639 0207] and Xu Xiyu [1776 6932 6877] (Shanghai City Xinhua Hospital)

This article reported on our hospital's use of an expanded CO<sub>2</sub> laser beam for long-range patients of a total of 298 cases during the past 6 months. The CO<sub>2</sub> laser was used to treat 227 cases and the He-Ne laser was used to treat 82 cases. There were 7 cases which were subjected to irradiation by the two types of lasers. Diseases included those in dermatology, otolaryngology, ophthalmology and stomatology, surgery, gynaecology and obstetrics and stomatology. Effective treatment was realized in all areas.

#### Brief Summary of the Clinical Application of the Small Power Helium-Neon Laser

Li Shunchang [2621 7311 2490] (Department of Dermatology of the Fourth Shanghai People's Hospital)

This article introduced the use of a small power (2 to 3 milliwatts) helium-neon laser to treat various types of dermatosis in 188 cases. Effective treatment was realized in all cases.

#### Clinical Analysis of the Treatment of Various Types of Skin Tumors in 710 Cases by a CO<sub>2</sub> Laser

Wu Qingzhen [0702 1987 6297] (Ruijin Hospital of the Second Shanghai Medical College)

#### Exploring the Mechanism of the Effects of an Argon Laser and a Frequency Multiplied Nd:YAG Laser in Treating Angioma

Wu Qingzhen [0702 1987 6297] (Ruijin Hospital of the Second Shanghai Medical College)

Clinical Analysis of the Use of a He-Ne Laser To Irradiate and Treat Cases of Mucous Skin Ulcers Not Cured by Other Methods  
He Fangde [0149 5364 1795] (Huadong Hospital)

Application of an Nd<sup>3+</sup>:YAG Laser To Treat Internal Hemorrhoids  
Zuo Ruipeng [0587 3843 7720] and Xu Songlin [6079 2646 2651] (Second Shanghai Medical College)

Shi Qichang [4258 0366 2490] and Chen Shuiping [7115 3055 5473] (Shanghai City Construction Workers Hospital)

This article reported on the use of an Nd<sup>3+</sup>:YAG laser to treat patients suffering from II to III stage internal "ring" hemorrhoids and mixed hemorrhoids in 42 cases. Followup visits showed the treatment was effective, and the percentage effective treatment reached over 95 percent.

The Use of a Ruby Laser To Treat Internal Hemorrhoids

Xu Yigeng [6079 5030 1649], Gong Weizhen [7895 4850 2182] and Ma Meirong [7456 5019 2837] (Shanghai Huangpu Ward Central Hospital)

Wang Youmin [3769 0147 3046] and Shan Yijun [0830 0001 0689] (Shanghai Xuhui Ward, Tianping Section Hospital)

Tang Aimei [0781 1947 2734], Cao Guoqiang [2580 0948 1730] and Chen Aimei [7115 1947 2734] (Shanghai Heli Electrical Machinery Plant)

This article reported on the application of a ruby laser iridectomy device. The output energy of the pulse was--6 joules. It was used to irradiate and treat internal hemorrhoids, and treatment was effective.

Preparation of the Cell Sample for Flow Analysis by Laser

Shi Xuegeng [4258 1331 5087], Jiu Bingrong [0491 3521 2837] and Li Zhaozhang [2621 0340 3864] (Biophysics Teaching and Research Group of the Second Shanghai Medical College)

In flow analysis of cells, preparation of the cell sample is very important. We successfully used acridine orange fluorescence to stain the red blood cells of chickens, the red blood cells of toads, the peripheral white blood cells of small white mice, marrow cells, and peripheral white blood cells of rabbits. This article introduced the method of preparing the cell sample for laser flow analysis.

Conduction of Energy from a Continuous Wave Infrared Laser in the Skin

Liu Bingrong [0491 3521 2837], Li Zhaozhang [2621 0340 3864] and Wu Jianu [0702 1367 1166] (Medical Laser Research Laboratory of the Second Shanghai Medical College)

This article described the selective use of two types of continuous wave infrared lasers to irradiate the body surface of animals, and measured temperature changes in the tissues. This was used to explore the relationship between tissue damage inflicted by the laser and temperature.

Effect of Irradiating the Acupuncture Point of the Ear by a Helium-Neon Laser upon Salivation

Zheng Zhanpei [6774 4232 1014] and Ding Weiyuan [0002 5588 1626] (Shanghai City Psychosis Prevention Hospital)

This article introduced the use of a helium-neon laser to irradiate the acupuncture point on the ear as a substitute for needle acupuncture to treat



20 cases of schizophrenic patients who salivated after taking oral thorazine. The treatment was an effort to combine Chinese medical theories of the meridians and modern medical techniques. Relatively satisfactory results were realized.

#### The Use of a YAG Laser Fitted with Optical Fibers To Treat Angioma

Xu Yigeng [6079 5030 1649], Gong Weizhen [7895 4850 2182] and Zhuang Ruixiang [8369 1878 4382] (Shanghai City Huangpu Central Hospital)

This article reported on the use of a YAG:Nd<sup>3+</sup> laser fitted with optical fibers. Its continuous output power reached 15 watts to treat angioma. Results were obtained after many irradiations.

#### The Effect of a CO<sub>2</sub> Laser on Damaged Peripheral Nerves

Workers' Hospital of the Anhui Optics and Precision Instruments Institute of the Chinese Academy of Sciences

Laser Medicine Research Laboratory of the First Shanghai Medical College

This article introduced the use of a CO<sub>2</sub> laser to cure over 10 cases of patients (including contusions and broken limbs). Satisfactory results were obtained at different times in all cases. The functions of paralyzed limbs were partially or fully restored. It is believed that the use of the CO<sub>2</sub> laser to treat damaged peripheral nerves is a method worth exploring.

#### Laser Evaporation of Brain Tumors

Xu Qiwu [1776 0796 2976] and Chen Gongbai [7115 0361 4101] (Neuropathy Research Institute of the First Shanghai Medical College)

This article introduced the application on the CO<sub>2</sub> laser vaporization technique using the lowest power density of 1012 to 1408 watts/centimeter<sup>2</sup> to operate on tumors of the cerebral hemisphere in 30 cases. At the same time, 20 cases of patients operated on by ordinary surgery were used as control cases for contrast. The effectiveness of treatment and reactions were compared and observed.

#### Measuring the Behavior of a Helium-Neon Laser Beam after Penetrating the Tissue

Liu Defu [0491 1795 0265] and Zeng Zhen [2582 4176] (Chinese Medicine Department of Ruijin Hospital of the Second Shanghai Medical College)

Jian Decai [4675 1795 2088] and Wan Xinnong [8001 2450 6593] (Fudan University)

This article introduced the use of a He-Ne laser to penetrate the tissues of pork, dead and live domesticated rabbits, corpses and live human beings.

Experiments showed the He-Ne laser that penetrated the tissue obeyed exponential attenuation. The experiment also measured the attenuation coefficient in the tissue of a live human being as  $\alpha \approx 0.3/\text{millimeter}$ .

According to the formula  $E_T(L) = E_0 e^{-\alpha L}$ , if we know the power of the laser incident upon the tissue of the human body and if we measure the reflectivity of the skin surface, we could calculate the power of the laser beam in the tissue of the human body at any depth.

#### The Use of an Endoscope Argon Ion Laser for Laser Coagulation To Treat Massive Hemorrhaging Accompanying Digestive Ulcers and Stomach Erosion

Xiao Shudong [5135 2885 2639] (Third People's Hospital of the Second Shanghai Medical College)

Emergency treatment of nine cases of digestive ulcers or stomach erosion accompanied by massive hemorrhaging was performed using endoscope examination and an argon laser to stop the hemorrhaging (the power of the output end of the optical fiber was 4.8 to 6.2 watts, duration was 15 to 45 seconds). The results were satisfactory.

#### A Laser Coagulation Treatment System Using an Endoscope Argon Ion Laser

Zhu Jing [2612 5464], Zhu Yaozhen [2612 6460 3791], Zhang Huiguo [1728 1979 0948], Ma Jizhuang [7456 4949 1104], Xiao Shudong [5135 2885 2639], Hu Yunbiao [5170 6663 1753] and Zhang Dezhong [1728 1795 0022] (Third People's Hospital of the Second Shanghai Medical College)

This article reported on the structure and test data of a coagulation treatment system using an endoscope argon ion laser which we have used clinically. The power of the output end of the optical fiber was 4.8 to 6.2 watts and the light guiding percentage was 290 percent.

#### Using an Endoscope Laser To Treat Hemorrhaging in the Digestive Tract (I)

Lu Hanming [7120 3352 2494], Xu Youru [6079 1635 1172], Wang Xiuling [3769 4423 3781] and Yao Xiaoheng [1202 2556 5899] (Third Research Laboratory of Digestive Diseases of the Second Shanghai Medical College)

Zhang Wenke [1728 2429 0344], Wang Yikang [3769 1744 1660], Chu Yude [0328 2810 1795], Qiao Fang [0829 2455], Xu Xuelin [6079 1331 7207] Dong Shimin [5516 6108 3046] and Wei Tingfa [7279 1656 3127] (Xinhua Hospital of the Second Shanghai Medical College)

This article reported on the results of using a full set of domestically produced equipment to conduct experiments to stop hemorrhaging in a dog's stomach by coagulation at our hospital since 1977.

#### Treatment of Hemorrhaging in the Digestive Tract Using an Endoscope Laser (II)

Lu Hanming [7120 3352 2494], Xu Youru [6079 1635 1172], Wang Xiuling [3769 4423 3781], Yao Xiaoheng [1202 2556 5899] and Jiang Jinghao [1203 7231 6275] (Third Research Laboratory of Digestive Diseases of the Second Shanghai Medical College)

Zhang Wenke [1728 2429 0344], Chu Yude [0328 2810 1795], Qiao Fang [0829 2455], Wei Tingxuan [7279 1656 3514], Wang Yikang [3769 1744 1660] and Xu Xuelin [6079 1331 7207] (Xinhua Hospital of the Second Shanghai Medical College)

We treated a preliminary group of 14 cases of acute hemorrhaging in the digestive tract and obtained good preliminary results on the basis of using a whole set of domestically manufactured equipment for experimental research and after obtaining firsthand information on the reliability and safety of using the endoscope argon laser to treat hemorrhaging in the digestive tract. We also referred to foreign documents and reports on clinical experience gained in the use of such treatment.

#### Discussion of the Effectiveness of Using a Helium-Neon Laser with a Guiding Light Beam for Irradiation of the Internal Cavities To Treat Ulcerous Colitis in 75 Cases

Xu Yigeng [6079 5030 1649], Gong Weizhen [7895 4850 2182], Zeng Xianmin [2582 2009 3046] and Xu Meijie [1776 2734 3381] (Shanghai City Huangpu Central Hospital)

This article reported on the use of a guiding light beam to guide a helium-neon

laser into the intestinal cavity to treat ulcerous colonitis in a total of 120 cases. The 75 cases which have completed treatment and which have been fully documented were analyzed and discussed.

#### Further Observation of the Use of a Laser To Treat Angioma of the Oral Cavity and on the Face

Ma Baozhang [7456 1405 4545] and Zhou Hui [0719 1979] (Ninth Hospital of the Second Shanghai Medical College)

Xu Songlin [6079 2646 2651] and Zui Ruipeng [0587 3843 7720] (Biophysics Teaching and Research Laboratory of the Second Shanghai Medical College)

This article analyzed the results of treatment of 304 cases of angioma patients using the Nd:YAG laser. Statistical analysis showed that the use of the Nd:YAG laser to treat angioma of the oral cavity and the face is an effective method. After treatment, focus could be eliminated and the original anatomic shape could be retained. The results were satisfactory. The article also discussed several points about the experience in such irradiation treatment.

#### Preliminary Utilization of the CO<sub>2</sub> Laser Scalpel in Surgery in the Oral Cavity, on the Chin and Face (I)

Mao Baozhang [7456 1405 4545], Qiu Weiliu [6726 5588 0362], Ha Qi [0761 3825], Xu Xiuqi [1776 4423 4388] and Zhou Hui [0719 1979] (Ninth Hospital of the Second Shanghai Medical College)

Zuo Ruipeng [0587 3843 7720] (Biophysics Teaching and Research Laboratory of the Second Shanghai Medical College)

This article reported on the application of the CO<sub>2</sub> laser scalpel to cut the soft tissues of animals and its clinical application. This article discussed the problems of technical training of the users and protection.

#### Preliminary Application of the CO<sub>2</sub> Laser Scalpel in Surgery in the Oral Cavity, on the Chin and the Face (II)

Mao Baozhang [7456 1405 4545], Xu Xiuqi [1776 4423 4388], Zhou Hui [0719 1979] and Liu Zhen [0491 2823] (Ninth Hospital of the Second Shanghai Medical College)

Zuo Ruipeng [0587 3843 7720] (Biophysics Teaching and Research Laboratory of the Second Shanghai Medical College)

This article reported on the application of the CO<sub>2</sub> laser scalpel in an experiment to cut the upper jaw bone and the lower jaw bone of a dog. The results proved that the power density on the focal spot of the laser was not lower than  $10^5$  watts/centimeter<sup>2</sup>. The cutting speed should be 1.5 to 2.0 centimeters high. Cutting the lower jaw bone of 1.0 to 1.5 centimeters thickness required 24 to 38 seconds. The damage of the cutting edge was about 2 to 3 millimeters. Clinical application involved 12 cases. This article also noted points of caution in cutting and proposed opinions on improvement of the laser scalpel.

#### Application of the CO<sub>2</sub> Laser in Creating Bone Puncture in Nasolacrimal Anastomosis

Nie Chuanxian [5119 0278 6343] (deceased), Wang Hanquan [3076 3352 3123], Tan Songnian [6151 2646 1628] and Shi Xianghe [2457 7449 5440] (Department of Ophthalmology of Ruijin Hospital of the Second Shanghai Medical College)

Zuo Ruipeng [0587 3843 7720], Wnag Yaojin [3769 6460 6651], Xu Shuiyun [1776

0355 0061] and Jiang Maoying [3068 5399 5391] (Laser Research Laboratory of the Second Shanghai Medical College)

This article reported on the clinical application of the CO<sub>2</sub> laser based on repeated animal experiments. It was realized that using the CO<sub>2</sub> laser to create bone puncture has many advantages. The CO<sub>2</sub> laser has also begun to be applied in the realm of ophthalmology.

Preliminary Experimental Results of Holography of the Bottom of the Eye  
Yao Wenhua [1202 2429 5478], Chen Shanhua [7115 0810 5478] and Jia Yuran [6328 3768 3387] (Fudan University)

Wang Kangsun [3769 1660 1327] (Ruijin Hospital of the Second Shanghai Medical College)

This article reported on design considerations of a holographic optical system for photographing the bottom of the eye and preliminary experimental results of a holographic display of a model eye and the eye of a domesticated rabbit.

Use of an Argon Ion Laser To Treat Red Moles and Simple Angioma

Zhu Jing [2612 5464], Mao Weihai [3029 4850 5060], Zhu Yaozhen [2612 6460 3791], Zhang Huiguo [1728 1979 0948] and Ma Jizhuang [7456 4949 1104] (Department of Dermatology of the Third People's Hospital of the Second Shanghai Medical College)

This article reported on the clinical experience in using a continuous argon ion laser to treat red moles and simple angioma. It also reported on the use of the crown of a Leghorn cock as a model to observe the change in the tissue after irradiation by the argon laser. The output power of the device through the light guiding joint was 1.2 to 3 watts.

Observation of the Effect of a CO<sub>2</sub> Laser upon the Sperm of the Domesticated Rabbit and Large Mice

Embryo Teaching and Research Group of the Second Shanghai Medical College  
Laser Laboratory of the People's Hospital in Jinshan County in Shanghai

This article reported on the use of a CO<sub>2</sub> laser with an output power of 22 watts for enlarged beam irradiation of the testis of 19 large mice (8 controls) and 18 domesticated rabbits (9 controls). The results showed the order of hindrance of the sperms was the same as the order of property changes in the cells caused by heating. It indicated that interference of the sperms by the CO<sub>2</sub> laser may be caused by thermal effects.

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CSO: 4008/127



## APPLIED SCIENCES

### ELECTRICAL EQUIPMENT TECHNOLOGY CLINICS HELD IN SHANGHAI

Shanghai WEN HUI BAO in Chinese 15 Nov 81 p 1

[Article: "Engineers and Skilled Workers Act as 'Doctors,' 'Four Clinical Services' in Technology Are Profoundly Welcomed by Factories; Shanghai Electronics and Electrical Appliances Technology Association Creates a Good Service for Production"]

[Text] Reporter Ni Ping [0242 1627] reports: The Shanghai Electronics and Electrical Appliances Technology Association provides half a day each week to hold "clinical services" in technology. It accepts assignments from factories to solve related technical problems. The services provided to serve production have already expanded to "house calls," "consultation," and "referrals" in technical service. For over four years, it has helped factories solve more than 300 technical problems.

In serving factory production, the Electronics and Electrical Appliances Association organized a group of electrical engineers and skilled workers to participate in technical "outpatient service," "house calls," "consultations" and "referral" activities. The electronics and electrical appliances technology clinic set up in the building of the Science Association is frequently filled with people. Those who come for "outpatient services" are all leading cadres and technical personnel of factories. They bring along blueprints and explain to the "doctors" at the technical clinic how their equipment has malfunctioned or propose ideas about technical improvements of their plants and they hope to receive help. Both parties discuss the problems enthusiastically. Here, the departmental barriers are broken and there are no technical walls and fortresses.

The Second Shanghai Refractory Materials Plant has eight silicon controlled electric furnaces. Unusual situations have occurred many times and technical "doctors" were called upon to provide "house call" services. They analyzed and studied the situation together with the plant's technical personnel and found the cause and took corresponding technical measures. The problems were solved. The plant praised them as "a technical cavalry which can pass difficult tests."

This city has a south city material container dealer. Each day it retrieves and processes large bottles of different shapes. For many years, the bottles

were sorted manually. Labor intensity was high, work efficiency was low, and the dealer hoped to have an automatic numerically controlled bottle sorter. The technical "doctors" proposed an overall plan using grating inspection, pulsed counter and logical sorting for that unit to design and develop by itself. The scientific and technical personnel helped test the equipment and it has already begun operation.

Some of the imported cranes for the Bao Gang steel mill project were found to have defective automatic torsion devices. The technical "doctors" quickly found the cause of the malfunction and "referred" the case to instruments repair departments of concerned companies to repair the cranes by substituting domestically produced parts.

The technical "doctors" of the Electronics and Electrical Appliances Association performed well in serving the factories. The city's model worker and engineer He Jiahau [0149 1367 5478] of the Shanghai Tractor Plant, the city's model worker and electrical engineer Du Jingui [2629 2529 6311] of the Hudong Shipbuilding Yard, and instructor Zhang Renwei [1728 0086 0251] of the Shanghai Evening Engineering College totaling 21 comrades frequently gave up their leisure time and utilized Sundays and spare time for "house calls" and they solved problems quickly. They frequently said that "one must have career oriented desires to make contributions to the four modernizations."

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CSO: 4008/44

## APPLIED SCIENCES

### BRIEFS

MACHINE TRANSLATION RESEARCH--Shanghai, 10 Apr (XINHUA)--Chinese scientists have made progress in machine translation research, it was reported at a recent national symposium held in Shanghai. China began research on machine translation in 1957. Scientists have been working out the basic principles of machine translation. They have compiled several special dictionaries, formulated rules for analysis of grammar and semantics and designed computer programs. The machine translation systems jointly developed by the Institute of Linguistics under the Chinese Academy of Social Sciences and other institutes can now translate some scientific documents and articles from English into Chinese. [Text] [OW100732 Beijing XINHUA in English 0700 GMT 10 Apr 82]

CSO: 4010/4

## SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

### CYBERNETICS FOUNDER AIDS, ENCOURAGES YOUNGER SCIENTISTS

Beijing GUANGMING RIBAO in Chinese 19 Feb 82 p 1

[Article by Su Wenyang [5685 2429 3152]: "Why Did Qian Xuesen Not Come To Receive His Prize?—An Interview With Song Jian, Coauthor of 'Engineering Cybernetics'"; reprinted from BEIJING WANBAO, unabridged]

[Text] On the afternoon of 17 February, a national meeting was held in the west hall of the National Culture Palace to present prizes for outstanding books on science and technology. One of the winning works was "Engineering Cybernetics," by Qian Xuesen [6929 1331 2773] and Song Jian [1345 0256]. At the meeting, beside the third table, was seated a middle-aged scientist. He was Song Jian, director of the standing council of the China Automation Society. He cast a glance at a vacant seat on the rostrum which was reserved for Qian Xuesen. However, Qian Xuesen did not come to receive his prize.

In his office, I interviewed Comrade Song Jian. "It's been 20 years from the time Chairman Qian (Qian Xuesen is now vice chairman of the National Defense Scientific and Technological Commission) proposed revising the original book to this year, when it has won the prize." Song Jian first talked about the history of this book.

The first edition of "Engineering Cybernetics" was originally written in English by Qian Xuesen, and was published in 1954 in the United States. He wrote this book by summing up into general theory the practical experiences of engineering at that time, thus creating this new branch of science and technology [called] engineering cybernetics; [this book] has been generally accepted as the authoritative work that laid the foundation. In the United States at that time, it was taken as a "book from heaven." According to an American professor from Harvard University who visited China in 1980, "Qian Xuesen's scientific thinking is far ahead of the times." Engineering cybernetics, the theory of relativity, and quantum theory are called the three great achievements of the 20th century. Later, this book was published successively in Russian, German, and Chinese editions.

"In 1962 Chairman Qian asked me to revise his original book. At that time, I had many things to do and not much time, so I organized a group of comrades to assist me in this work. Soon after we completed the first manuscript, we saw that it was absolutely impossible to publish it at that time. During the 10

years of internal disturbance, all the plates and some parts of the manuscript which had been sent to the publishing house were totally lost." While we were discussing these circumstances, Song Jian emotionally told me a very touching incident. One day at the beginning of the 10-year turmoil, Song Jian received a parcel of material in the mail. He opened it and found that it contained parts of the manuscript of the book. The sender was a stranger to him. Song Jian said: "When I received these sections of the manuscript, I very quickly handed them over to Chairman Qian. His secretary ran great risks keeping the remaining parts of the manuscript in a safe place for over 10 years. In 1978, the publishing house again proposed publishing this book. Under Comrade Qian Xuesen's direction, we began to do this work again."

When the new book was being published, Qian Xuesen called together Song Jian and two others, Yu Jingyuan [0060 2529 0337] and Tang Zhiqiang [0781 1807 1730], who had taken part in the writing, to discuss the question of naming its authors. Qian Xuesen said: "In the first place, this book shouldn't bear my name, as I haven't done any of the work. Secondly, Comrade Song Jian should be named chief editor. In the matter of breaking away from the Chinese tradition of stressing one's seniority and rank, we should learn from Premier Zhou." As Yu Jingyuan recalled, when Qian Xuesen was speaking, his eyes were moist with tears. Song Jian told me: "All of us disagreed with him. As his students, it was our duty to assist the senior scientist in doing work. We should do more work. Besides, it was a collective accomplishment, as there were a dozen comrades who had worked on this book." On this occasion, Yu Jingyuan made a suggestion that since Qian Xuesen was the founder of this branch of science and also the founder of the new edition of this book, it was only natural to put his name down, and that inasmuch as Song Jian was an outstanding representative of our generation, it was also natural to put his name down. Qian Xuesen persistently disagreed to having his name inscribed. At most, he said, his name might be mentioned as the original author. The discussion came to no conclusion. Finally, the publishing house made the decision to name both Qian Xuesen and Song Jian co-authors.

Qian Xuesen was not simply being modest. He had the idea that old people should take the lead in handing over [the reins] to the next shift, and that they should help middle-aged and young scientists grow more quickly. When he first asked Song Jian to revise his original book, the latter [Song] was just over 30 years of age. Not Song Jian alone but many middle-aged and young scientific workers all have received his assistance. Now, in spite of his advanced age of 71, Qian Xuesen every day writes carefully and neatly at least one letter in reply to those middle-aged and young people who have asked for his advice by mail. Song Jian told me: "Chairman Qian boldly allows young people to have a free hand to do things, has faith in them, and relies on them. This spirit is very touching."

Song Jian opened a copy of "Engineering Cybernetics" and showed me a long preface written by Qian Xuesen inside. In this preface, Qian Xuesen says: "They, particularly Comrade Song Jian, took the lead in organizing [the writing group], personally wrote the final manuscript, and completed the greatest part of the work. They are the creators of this new edition. I am more than ever convinced that with people of their generation, we have the guarantee for carrying out the four modernizations. I haven't done any work on this new edition...." Before



I could read further, I was interrupted by Song Jian's words: "As a matter of fact, in the course of the revision we retained almost the whole text and all the chapters and sections of the original book, and in working on the revised edition--from making the plans to supplementing the text with new material--we were entirely under the guidance of Qian Xuesen. He carefully scrutinized every chapter and every section, and even made changes on the final proof."

Why did Qian Xuesen not come to receive his prize? He has handed over to the middle-aged and young people the responsibility of promoting science in our motherland. This is the greatest encouragement that scientists of the older generation can give to the middle-aged and younger generation.

9039

CSO: 4008/119

## Engineering

AUTHOR: YAN Huailiang [7346 2036 2733]  
GU Leguan [7357 2867 6034]

ORG: Both of the Department of Electrical Engineering, Chongqing University

TITLE: "Calculation for the Insulation Flashover Probability of Transmission Line under Switching Surge"

SOURCE: Chongqing CHONGQING DAXUE XUEBAO [JOURNAL OF CHONGQING UNIVERSITY] in Chinese No 4, 1981 pp 34-45

TEXT OF ENGLISH ABSTRACT: This paper presents an approximate method for calculating the overvoltage of transmission lines (the parameters of the transmission line and source are known), caused by reclosing switching. The overvoltage distribution along the transmission line is used for calculating the equivalent tower numbers of transmission lines. The insulation flashover probability, caused by any one reclosing operation, and the insulation flashover number per year of the transmission line are estimated with the obtained relationship between the overvoltage and the reclosing phase angle  $\varphi$ .

AUTHOR: JIANG Bingchen [3068 4426 3819]

ORG: Applied Mechanics Teaching and Research Group, Chongqing University

TITLE: "Asymptotic Analysis of Problems with Boundary Forms of Small Asymmetry"

SOURCE: Chongqing CHONGQING DAXUE XUEBAO [JOURNAL OF CHONGQING UNIVERSITY] in Chinese No 4, 1981 pp 46-59

TEXT OF ENGLISH ABSTRACT: Using the regular perturbation method, a series of asymptotic equations and corresponding boundary conditions of those problems, in which the geometric forms of the boundary surfaces are characterized by small asymmetry, has been established. For every order of the asymptotic solution, the dimensionality of the problem has been decreased by one. Thus the analytic solutions of some two-dimensional problems may be obtained, and some complex three-dimensional problems can be transformed into two-dimensional problems so that the quantity of numerical computation can be greatly decreased. At the same time, it is believed that a theoretical basis and a method of modification have been given to the commonly-used "revolution-profile method."

As examples, the analytical solutions of the temperature field and the stress field in a hollow cylinder with eccentric circular inside hole have been given and the distributions of temperature and stress on a profile have been drawn. These results show that the method suggested in this paper is feasible.

AUTHOR: QIAN Hancheng [6929 5060 1004]  
ZHAO Kangjie [6392 1660 4105]  
QI Mengdiao [7871 1322 7171]  
LI Shuqing [2621 5771 1987]

ORG: All of the Second Department of Chemical Engineering, Chongqing University

TITLE: "A High Temperature Metallographic Observation of the Crystallographic Process of a Hypoeutectic Cast Iron in Liquid-Solid Region"

SOURCE: Chongqing CHONGQING DAXUE XUEBAO [JOURNAL OF CHONGQING UNIVERSITY] in Chinese No 4, 1981 pp 70-83

TEXT OF ENGLISH ABSTRACT: The crystallographic process of a hypoeutectic cast iron freezing from the liquid-solid region has been observed directly with a high temperature microscope and recorded by a telecamera. It is shown that the precipitation rate of the graphite is increased rapidly in the moment of the primary eutectic reaction. Concerning the growth type of graphite, in addition to the dendrite growth type, we have observed the colliding combination at the time of nucleation and the primary period of eutectic crystallization, and the binding growth at the time of the middle and last eutectic reaction. The graphite precipitation related to the austenite crystallization has also been observed, with the austenitic shells around the graphite being formed at the last time of solidification. In case of non-equilibrium freezing, the crystallization process of the primary austenite has not been observed, whereas the quasi-eutectic reaction has.

AUTHOR: CHEN Derong [7115 1795 2837]  
CHEN Songde [7115 7313 1795]  
WEI Ruihang [7614 3843 5300]

ORG: All of the Department of Metallurgy and Materials Engineering

TITLE: "An Investigation of Sigma Phase in Heat Resisting Iron Base Alloy Pipe"

SOURCE: Chongqing CHONGQING DAXUE XUEBAO [JOURNAL OF CHONGQING UNIVERSITY] in Chinese No 4, 1981 pp 84-97

TEXT OF ENGLISH ABSTRACT: Utilizing superalloy turning as the raw material, a heat resisting alloy pipe has been developed for gas converter and cracking furnace. In industrial testing, it was shown that all its properties came at and/or surpassed the technical standards (ASTM 351) of HK40 centrifugal casting pipes, but the  $\sigma$ -phase was precipitated in the aging process. In this paper, according to the characteristics of this alloy, by means of the procedure known as PHACOMP, four kinds of alloys are designed with the tendency of  $\sigma$ -phase precipitation corresponding to the experimental results, and the range of proper alloy composition for controlling the formation of the  $\sigma$ -phase is recommended. Therefore, "PHACOMP" provides the basis for quality management of products.

AUTHOR: LU Shizhong [4151 0013 1350]

ORG: Department of Rock Mechanics

TITLE: "The Features of Structural Discontinuity and Slope Stability in the Dagushan Strip Mine"

SOURCE: Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 1, 1982 pp 11-23

TEXT OF ENGLISH ABSTRACT: Structural discontinuity is an important factor of the strip mine which exerts an influence on slope stability. Based on the data from a long-time survey *in situ*, a geomechanical method is applied to the investigation of the features of structural discontinuity in the Dagushan strip mine. In this mine, we find the existence of the typical horizontal and lateral "x" shear fractures in the Anshan metaphormic rock formations comprising the compound rock, iron ore bed and chlorite quartz schist. The slope stabilities of the hanging-wall and the foot-wall are both dependent on such shear fractures. For the structural discontinuities in the south slope or the footwall part, the dip angles declining to the openwork are smaller than the bench slope angle there, but greater than the angle of friction on the surface of discontinuity. In such a case, the structural discontinuities can cause a wedge failure to the slope in combination with the shear fracture in the NEE strike. The slope stability of the north slope or the hanging part is better than that of the south slope because the dipping of the bedding plane of chlorite

[Continuation of DONGBEI GONGXUEYUAN XUEBAO No 1, 1982 pp 11-23]

quartz schist is inward to the slope surface. The bench slope angles are proposed to be  $55^\circ$  for the south slope and  $65^\circ$  for the north slope, and the overall slope angle would be dependent on the bench slope angle as well as the condition of the mining process. For the northwest, the overall slope angle is proposed to be  $35^\circ$ ~ $40^\circ$  since the rock mass is composed of graphite phylletes and compound granites and so lies in fragments. In view of the better structural condition of the granite rock mass in the east, the overall slope angle may be raised to  $45^\circ$ ~ $50^\circ$ , which is greater than the  $41.5^\circ$  angle originally designed, thus probably reducing the stripped rock by 25 million tons. By a rough estimate, a decrease of over 20 million tons of stripped rock is bound to be followed by an increase of  $1^\circ$  of the overall slope angle if the open pit has a depth of 500 m.

AUTHOR: ZAI Xiangyong [1363 4161 0516]  
LIU Yongquan [0491 3057 6898]

ORG: Both of the Department of Heat Treatment

TITLE: "The Application of Rare Earth to Free-cutting Steel--An Investigation of the Steel 20CrRES"

SOURCE: Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 1, 1982 pp 63-71

TEXT OF ENGLISH ABSTRACT: With the observations and analyses for the shapes of RE inclusions and the change of chemical composition by the use of EPMA, Quantimet-720 microscope and X-ray diffraction, the purpose of this article is to investigate the influence of RE taken as an alloying addition to the steel on the machinability of the commercial low alloy steel 20Cr. Detailed descriptions of the following problems are given:

- whether the steel 20Cr can become free-cutting by adding RE;
- the mechanism of free-cutting after adding RE;
- the mechanical properties and relevant technical abilities of the 20Cr steel with an RE addition even though its free-cutting ability has been attained.

It has been found that through adding the free-cutting element S to the base steel 20Cr and controlling the composition and shapes of inclusions in the steel by

[Continuation of DONGBEI GONGXUEYUAN XUEBAO No 1, 1982 pp 63-71]

adding RE alloying elements with Ce first, the machinability of 20CrRES steel is significantly improved, while the mechanical properties and other technical abilities of 20Cr remain unchanged. On the surface of the TiC bearing carbide tool for cutting, a protective layer of RE inclusions is formed and a "wrapping effect" of RE inclusions has been discovered. They are both very important factors for explaining the free-cutting mechanism of the steel 20CrRES tested.



AUTHOR: LIU Changren [0491 7022 0088]  
ZHU Weiyong [2612 0251 0516]

ORG: LIU of the Department of High Temperature Alloys; ZHU of the Department of Mathematics

TITLE: "The Determination of Technical Parameters in Laser Transformation Hardening to CrMn Steels"

SOURCE: Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 1, 1982 pp 81-90

TEXT OF ENGLISH ABSTRACT: In order to attain the hardenite structure on the surface of a certain CrMn steel, a kind of surface hardening method with laser irradiation has been introduced by a JL6A closed-cycle traversing irradiation CO<sub>2</sub> laser. As a result, an increase of the microhardness of about 200 units (HM<sub>0.1kg</sub>) was measured. With the difference from the existing methods of heat calculation for laser heat treatment, the present work attempts to apply an orthogonal regression analysis to experiment designs with the purpose of obtaining the relationship between the hardening depth  $\bar{Z}$  and such technical factors as the power for laser irradiation  $p$ , the diameter of the laser beam  $d$  and the traversing speed of irradiation  $v$ . The expression is as follows:

$$\begin{aligned}\bar{Z} = & -2.95 + 0.002472p + 2.0815d + 0.0138v - 0.001084pd \\ & -4.33 \times 10^{-7}pv - 0.0118vd + 8.8 \times 10^{-8}p^2 - 0.2575d^2 \\ & + 1.847 \times 10^{-7}v^2 + 1.25 \times 10^{-7}pdv\end{aligned}$$

[Continuation of DONGBEI GONGXUEYUAN XUEBAO No 1, 1982 pp 81-90]

A discussion of the influence of the technical factors mentioned above on hardening depth has been presented in more detail, particularly concerning the complicated effect of the laser beam diameter  $d$  on the hardening depth  $\bar{Z}$ . This effect is expressed quantitatively by the following simple formula, where  $p$  and  $v$  are equal to constants:

$$\bar{Z} = -0.2575d^2 + 1.189d - 1.1173$$

Furthermore, the equations and curves for controlling  $p$ ,  $d$  and  $v$  requisite for different hardening depths are obtained. The values of hardening depths calculated are compared to those measured and it is shown that they are fair in conformity. This method may be regarded as a new approach to the process control predictive for laser heat treatment as distinct from the accustomed method of heat transfer calculation.

AUTHOR: LIU Qingguo [0491 1987 0948]  
NIU Changsheng [3662 7022 3932]  
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ORG: LIU and NIU both of the Northeast Institute of Technology; GUO of the Shaanxi Steel Institute

TITLE: "The Effect of  $\beta$ -Phase in Ni-Mo Alloy on Its Mechanical Properties"

SOURCE: Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 1, 1982 pp 99-105

TEXT OF ENGLISH ABSTRACT: The purpose of the present work is to reveal the effect of a  $\beta$ -phase in the Ni-Mo alloy on its expansion characteristics and hardness by means of optical microscopy, electron microscopy, X-ray diffraction and dilatometer. The observation of the microstructure shows that the Ni-Mo alloy has a duplex phase of  $\alpha+\beta$  after extremely slow cooling. The  $\beta$ -phase is Ni<sub>4</sub>Mo which finely disperses throughout the  $\alpha$ -phase matrix. Based on the results of the microhardness test, this paper suggests that there exists a small amount of finely-dispersed  $\beta$ -phase in the alloy after the practical heat treatment. It has been found that the heat treatment affects considerably the hardness of Ni-Mo alloys. This leads to the formation of a remarkable precipitation hardening effect, even if only a small change of  $\beta$ -phase has taken place. The dilatometric measurements show that the thermal

[Continuation of DONGBEI GONGXUEYUAN XUEBAO No 1, 1982 pp 99-105]

expansion coefficient of Ni-Mo 22 alloy is less sensitive to heat treatment and possesses a good long-term stability. It is proposed that the occurrence of a second phase in the expansion alloy is not always harmful and useless.

9717  
CSO: 4009/295

## Geology

AUTHOR: WANG Yiwen [3769 5030 2429]

ORG: Research Institute, Jilin Provincial Metallurgical Geological Exploration Corporation

TITLE: "The Isotopic Study of Major Types of Gold Deposits of China"

SOURCE: Beijing DIZHI LUNPING [GEOLOGICAL REVIEW] in Chinese No 2, 1982 pp 108-117

TEXT OF ENGLISH ABSTRACT: According to 1364 data items of sulfur isotopes, 47 of lead isotopes and a large number of K-Ar and U-Pb age data from more than 100 gold deposits distributed in 14 provinces (or regions) in China, this paper first discusses the characteristics of sulfur and lead isotopes and the metallogenic epochs of different types of gold deposits, and then approaches some problems concerning the genesis of gold deposits.

The sulfur isotopic composition of metamorphic hydrothermal gold deposits is controlled by the sulfur isotopic background value of gold source beds and the metamorphic facies belts. Ore lead is either older (related to Archean greenstone belts) or younger (related to specific Phanerozoic horizons) anomalous lead. The lead mineralizing age calculated by the secondary isochron curves coincides with the age of metamorphism-migmatization of the strata. The age of source lead is equivalent to the formation age of the source beds. The sulfur isotopic composition

[Continuation of DIZHI LUNPING No 2, 1982 pp 108-117]

of sedimentary-metamorphic (transformation) gold deposits is controlled by stratigraphic levels. The  $\delta S^{34}$  values are highly variable and often remote from the meteorite values. Ore lead is ancient ordinary lead with a model age of 500-700 m.y. Its metallogenic epoch belongs to the Proterozoic. The sulfur isotopic composition of migmatized hydrothermal gold deposits is identical to that of their parent rocks, and both are controlled by the source beds and characterized by the enrichment of  $S^{34}$ . Ore lead is younger ordinary lead and the metallogenic epoch is Mesozoic. The sulfur isotopic composition of regeneration-anatectic magmatic hydrothermal gold deposits is characterized by the  $\delta S^{34}$  values that are close to those of meteorite and less varied. Their parent rocks are mostly assigned to the Yanshanian stage, but the ore lead is ancient anomalous lead, which indicates its regeneration nature.

Gold's conspicuous siderophile property, the close relationship between gold mineralization and Archean greenstone belts, the distinct stratabound feature and the inheritance and regeneration of gold mineralization--all these show that gold has the unique mineralization feature distinct from other metallic elements.

AUTHOR: WANG Wenbin [3769 2429 2430]  
WANG Runhua [3769 3387 5478]  
JI Shaoxin [1323 4801 2450]  
XING Wenchen [6717 2429 5256]

ORG: All of the Nanjing Institute of Geology and Mineral Resources

TITLE: "The Origin of Iron Ores of the Makeng Type in Southwestern Fujian as Viewed in the Light of Certain Characteristics of Magnetite"

SOURCE: Beijing DIZHI LUNPING [GEOLOGICAL REVIEW] in Chinese No 2, 1982 pp 118-125

TEXT OF ENGLISH ABSTRACT: Studies of the characteristics of magnetite, the principal ore mineral in iron ore deposits of the Makeng-type, clearly indicate that there are distinct differences in chemical composition between the magnetite of the main ore bodies, on the one hand, and that in granites within the deposit area and in the Pre-Devonian quartz-hornblende schists of the region on the other. The contents of  $TiO_2$ ,  $V_2O_5$ ,  $MgO$  and  $Al_2O_3$  in the main ore bodies are similar to those in the sedimentary metamorphic (volcano-sedimentary metamorphic) ore deposits, and are clearly lower than those in other types of ore deposits. A comparison of Makeng-type iron ores with the iron ores of volcanic eruptive-neritic sedimentary origin shows the similarity in the abundance and association of the mixed elements in magnetite. The content of Ge is higher in both iron ore and magnetite in

[Continuation of DIZHI LUNPING No 2, 1982 pp 118-125]

Makeng-type iron deposits. The above-mentioned characteristics of the magnetite combined with the geological conditions to form ore suggest that the main Makeng-type iron ore bodies appear to be of volcano-sedimentary origin and have been affected by later transformations after the formation of volcano-sedimentary iron deposits. In respect to the studies it is suggested that Makeng-type iron ore deposits belong instead to stratabound ore deposits of volcano-sedimentary-hydrothermal-transformation origin.

AUTHOR: LIU Yushan [0491 3768 1472]

ORG: None

TITLE: "Symposium on Experiments of Rock and Ore Formation Held in Beijing"

SOURCE: Beijing DIZHI LUNPING [GEOLOGICAL REVIEW] in Chinese Vol 28 No 2, Mar 82  
p 137

ABSTRACT: The National Symposium on Rock Formation and Mineralization, organized jointly by the Ore Deposit Geology Specialty Committee of Chinese Geological Society and the Experimental Mineral Rocks Geochemistry Specialty Committee of Chinese Mineral Rock Geochemical Society was held in Beijing on 20-26 Oct 81. This was the first national meeting of its kind. Participants included 56 delegates representing 38 scientific research, educational, and production units. The discussions included 2 major contents; new results of experimental research of recent years and techniques and problems of high temperature high pressure experiments. The symposium received 29 papers on mineralization experiments of iron, copper, tungsten, tin, mercury, uranium, rock formation experiments of granite, basalt, and the methods and techniques of high temperature high pressure experiments. Following discussions on ways of improving the precision of measuring the temperature and the pressure and other urgent problems, the Research Institute of Geochemistry Chinese Academy of Sciences was officially requested to help Shanghai Dalong Machinery Plant to make the 3000 kg/cm<sup>2</sup> stainless steel pump. Other organizations were also requested to make other tools needed for the experiments.

AUTHOR: PENG Gong [1756 6044]  
WANG Yishui [3076 6318 3055]

ORG: None

TITLE: "First National Scientific Conference on Mining Geology Held in Chenzhou, Hunan Province"

SOURCE: Beijing DIZHI LUNPING [GEOLOGICAL REVIEW] in Chinese Vol 28 No 2, Mar 82  
p 144

ABSTRACT: The First National Mining Geology Conference was held on 26-31 Oct 81 in Chenzhou City and 455 delegates, representing various ministries and organizations, attended. Of the 210 papers received, 17 were selected for delivery, dealing mainly with comprehensive studies of producing mines. Abstracts of more than 450 papers were compiled before the conference began. Based upon the concrete experiences of the 715 mine, the Zhongtiaoshan Colored Metal Company, the Yimen Copper Mine, the Xiangshan Iron Mine, etc. methods of improving mining technique to increase the rate of return and reduce losses were among the major subjects discussed.



AUTHOR: YAN Junfeng [7051 0193 1496]

ORG: None

TITLE: "National Symposium on Phosphate Deposits Held in Kunming"

SOURCE: Beijing DIZHI LUNPING [GEOLOGICAL REVIEW] in Chinese Vol 28 No 2, Mar 82  
p 147

ABSTRACT: The National Symposium on Phosphate Deposits, under the joint auspices of the Mineral Deposit Geology Specialty Committee and the Nonmetallic Ore Deposit Geology Specialty Committee of the Chinese Geological Society was held on 17-23 Nov 81. There were 120 delegates representing geological, construction material, metallurgical, and chemical engineering organizations and schools of higher education. This was China's largest conference on phosphate deposits in the years since the liberation. The conference received more than 90 papers and all of those received before 1 Sep were included in the Collected Abstracts of Papers. For the convenience of discussion, the conference was divided into 2 groups: (1) Genesis sedimentary environment, and ore geology of phosphorite; (2) Regional geology and ore formation principle; (3) Material composition and experimental utilization. A large number of delegates were in favor of the volcanic origin viewpoint. The conference reflected the progress of China's geological research on phosphate minerals of recent years. The distance from the advanced level of the world has obviously been shortened. All those in the country who work in the field of phosphate geology are prepared to welcome the 1982 International Phosphate Conference to be held in China.

AUTHOR: None

ORG: None

TITLE: "Symposium on Nanling Granite Held in Chenzhou, Hunan Province"

SOURCE: Beijing DIZHI LUNPING [GEOLOGICAL REVIEW] in Chinese Vol 28 No 2, Mar 82  
p 189

ABSTRACT: The Nanling Granite Scientific Symposium, jointly sponsored by the Petrography Specialty Committee of Chinese Geological Society and the Hunan Provincial Geological Society was held at the 408 Team of the Hunan Provincial Bureau of Geology in Chenzhou from 26 Oct to 1 Nov 81. A total of 110 delegates attended and 53 papers were received. The symposium was divided into 2 stages. The first stage opened with a speech by GUO Wenkui [6751 2429 7608], a representative of the Petrography Specialty Committee, and followed by reading papers and discussion of the 3 subjects of genetic types, chronological classification, and mineralization of the granites. Field visits were also conducted. The second stage began on 2 Nov, immediately following the closing of the symposium. The delegation was divided into 2 sections for 2 days of observation of Darongshan of Guangxi and Gushan of Fujian. Major fruits of the symposium, such as using the depth (crust or mantle) of origin as the basis of classifying granites, the obvious relationship between the granite and the tungsten, tin, bismuth, and molybdenum ores of Nanling, etc. are briefly reported.

AUTHOR: None

ORG: The Secretariat, Precambrian Geology Committee, Chinese Geological Society

TITLE: "Brief Introduction of the Symposium on Early Precambrian Metamorphic Volcano Sedimentary Sequences"

SOURCE: Beijing DIZHI LUNPING [GEOLOGICAL REVIEW] in Chinese Vol 28 No 2, Mar 82  
pp 189-190

ABSTRACT: A Symposium on the Early Precambrian Metamorphic Volcanic-Sedimentary System, under the joint auspices of the Precambrian Geology Specialty Committee of Chinese Geological Society and the Liaoning Provincial Society of Geology, was held on 14-19 Oct 81 in Shenyang. This was a large scale national symposium to discuss fundamental geological problems of the early Precambrian Period. Participants included 121 delegates of 62 organizations of the 6 systems of Ministries of Geology, Metallurgy, and Machinery, Chinese Academy of Sciences, National Bureau of Seismology, and specialty schools of higher education. Papers were read and subjects discussed in 3 separate groups: (1) Principles and methods of stratigraphical classification, isotope geological age method and problems of its application, geochemical cycle and sedimentary rhythm, etc. (2) Problems of the greenstone zone, the metamorphic zone, the silicon-aluminum crust, etc. (3) The early crust structure and its evolution, cycles of metamorphism and its mineralization action, structural sequence of metamorphic rocks, and regional metamorphism of east Liaoning, east Hebei, Nei Menggu, Yunnan, etc. Discussions of the Proterozoic Era in foreign countries and the recent visit to Canada were also introduced at the meetings.

AUTHOR: SHEN Baolin [3088 1405 3829]

ORG: None

TITLE: "First National Symposium on Clays Held in Jingdezhen, Jiangxi Province"

SOURCE: Beijing DIZHI LUNPING [GEOLOGICAL REVIEW] in Chinese Vol 28 No 2, Mar 82  
p 191

ABSTRACT: The First National Symposium on Clays, jointly sponsored by the Nonmetallic Ores Geology Specialty Committee and the Sedimentary Geology Specialty Committee of Chinese Geological Society, and the Chinese Society of Pedology, was held in Jingdezhen of Jiangxi from 29 Oct to 4 Nov 81 and 200 delegates representing organizations of geology, metallurgy, construction materials, light industry, schools of higher education, and academies of sciences attended. The more than 120 papers received constitute a reflection of research and progress of this field, including such advanced methods of testing as x-ray diffraction, heat differential analysis, chemical analysis, electron diffraction, infrared spectroscopy, Mossbauer spectrum, etc. The 2 delegates to the 7th International Clay Conference delivered their reports. The subject of classification and nomenclature of clay minerals was extensively discussed at the meetings and on the basis of the suggestions of XU Jiquan [6079 0370 2164] and FANG Yesen [2455 6777 2773], and following discussion, revision, and supplementation, a relatively perfect classification and nomenclature formula was finally agreed upon. The delegates also were organized into a geological observation team to visit nearby china clay mines.

AUTHOR: None

ORG: None

TITLE: "Symposium on Mineral Resources Protection Held in Wuxi, Jiangsu Province"

SOURCE: Beijing DIZHI LUNPING [GEOLOGICAL REVIEW] in Chinese Vol 28 No 2, Mar 82  
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ABSTRACT: The Mineral Resources Protection and Comprehensive Utilization Specialty Committee of Chinese Geological Society called a symposium on mineral resources protection on 11-17 Nov 81 in Wuxi. More than 90 delegates representing various organizations all over the country attended. The discussions emphasized the existing problems of development and utilization of China's mineral resources. The delegates affirmed the achievements of the past 32 years in geological prospecting, mine construction, and ore processing but also pointed out the shortcomings of uneven distributions of mineral products, too many poor deposits, and the fact that in spite of rich mineral resources, the per capita mineral resources remain low, considering that they are nonrenewable. Several suggestions were presented and discussed at the meetings for the purpose of protecting and conserving these limited resources.

6248

CSO: 4009/299

AUTHOR: LAI Wujiang [6351 0124 3068]  
BAI Zhenggu [4101 7201 6253]

ORG: Both of the Department of Chemistry, Institute of Physical Chemistry

TITLE: "Quantum Chemical Calculation of Coordination of  $N_2$  on Xiamen Model III of Nitrogenase Active Center"

SOURCE: Xiamen XIAMEN DAXUE XUEBAO [JOURNAL OF NATURAL SCIENCE OF XIAMEN UNIVERSITY] in Chinese No 1, 1982 pp 40-47

TEXT OF ENGLISH ABSTRACT: The two modes of  $\mu_3(\eta^2)$  coordination of  $N_2$  on the modeling compound of nitrogenase active center, i.e., Xiamen Model III which was proposed by CAI Qirui [5591 0796 3843], were treated by group orbitals EHMO. It was shown that the overlap population between the two N atoms of molecular nitrogen for both modes of coordination is much less after coordination. Thus, the triple bond of the coordination  $N_2$  is weakened and activated; the coordination bond energy for both modes of coordination is large. However, both the total energy and coordination bond energy favor the single end-on plus double-side-on more than the alternative mode. After coordination, the two N atoms on the modeling compound both have negative charges which will facilitate reaction with electrophilic reagent, e.g.,  $H^+$ , to form  $NH_3$  or compounds containing N. Thus, the results prove that Xiamen Model III of a nitrogenase active center is reasonable from the viewpoint of quantum chemistry.

AUTHOR: QIU Shuyuan [8002 2579 7108]

ORG: Department of Oceanography

TITLE: "A Preliminary Study on the Sardines of the South China Sea"

SOURCE: Xiamen XIAMEN DAXUE XUEBAO [JOURNAL OF NATURAL SCIENCE OF XIAMEN UNIVERSITY] in Chinese No 1, 1982 pp 55-67

TEXT OF ENGLISH ABSTRACT: 1. From the summer of 1979 to the spring of 1981, a survey of the sardinid fish of the South China Sea was conducted by the author. The present paper gives a description of 10 species of sardines (i.e., *Sardinella aurita*, *S. fimbriata*, *S. jussieu*, *S. clupeioides*, *S. melanura*, *S. perforata*, *S. brachysoma*, *S. zunasi*, *S. nymphaea* and *S. hualiensis*), among which the last species is recorded here from the coast of the mainland for the first time by the author.

2. The distribution of these sardine species in the northern part of the South China Sea is briefly analyzed.

3. A comparison of the morphology of scales suggests that the 10 species of sardines can be separated into 3 groups: the most primitive one includes *Sardinella zunasi*, *S. nymphaea* and *S. hualiensis*, the more advanced one includes *S. aurita*, *S. jussieu*, *S. melanura* and *S. clupeioides*, and the intermediate one includes *S. perforata*, *S. brachysoma* and *S. fimbriata*. This kind of grouping is in accordance with certain ecological data (such as geographical distribution) of these species.

[Continuation of XIAMEN DAXUE XUEBAO No 1, 1982 pp 55-67]

4. A survey of the geographical distribution of the 15 species of sardines from the Indo-Pacific reveals that the faunistic center of the genus *Sardinella* lies in the Philippines, Taiwan and an Indonesian area called Indo-Malayan subregion by Sven Ekman, who suggested that this subregion is the distribution center of the warm water fauna of the Indo-Pacific (Indo-West-Pacific as called by Ekman). Thus Ekman's theory is now further substantiated by the present investigation.

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TITLE: "Preliminary Study of Seasonal Changes of Species Compositions of Demersal Fish in South Fujian Taiwan Bank Fishing Ground"

SOURCE: Xiamen XIAMEN DAXUE XUEBAO [JOURNAL OF NATURAL SCIENCE OF XIAMEN UNIVERSITY] in Chinese No 1, 1982 pp 68-83

TEXT OF ENGLISH ABSTRACT: In South Fujian Taiwan Bank fishing grounds, 255 species of fish belonging to 99 families and 180 genera have been identified from the trawl catches towed by two mechanized vessels or a single mechanized vessel. Analysis of the trawler landings during 1977-80 shows that the dominant species are *Parargyrops edita*, *Trichiurus haumela*, elasmobranchs, *Daya jordani*, *Trachurus japonicus*, *Selaroides leptolepis*, *Monacanthus sulcatus*, *Saurida tumbil*, *Saurida undosquamis*, *Decapterus maruadsi*, *Priacanthus macracanthus*, *Upeneus bensasi*, *Arius sinensis*, *Argyrosomus macrocephalus*, *Argyrosomus argentatus*, *Hemipleronotus caeruleo-punctatus*, *Parapristipoma trilineatum*, *Psenopsis anomala* and *Psenes indicus*, etc. *Parargyrops edita* and *Trichiurus haumela* are of primary importance throughout the year. The fish components of the Wai Xia area contain more tropical forms, indicating a greater tropical tendency. This is evidently due to the



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influence of a branch of the warm Kuroshio current which passes through the Taiwan Strait. The peak period for trawl fishery may occur during the summer and autumn, whereas the trawler landings from the inshore water becomes poorer in the winter. The average catch per haul from the offshore water is generally high in the winter because demersal fish have mainly migrated to deeper water.

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TITLE: "Diatoms from the Washings of Sea Weeds in the Xisha Islands, China"

SOURCE: Xiamen XIAMEN DAXUE XUEBAO [JOURNAL OF NATURAL SCIENCE OF XIAMEN UNIVERSITY] in Chinese No 1, 1982 pp 92-99

TEXT OF ENGLISH ABSTRACT: The present material was collected in 1947, from which we recorded 120 taxa of diatoms, 62.50 percent of which were widely-distributed species and 37.50 percent warm-water species. *Mastogloia* is the dominant genus, containing 24 species of diatoms. *Grammatophora marina*, *Mastogloia binotata*, *Mas. corsicana*, *Mas. crucicula*, *Climacosphenia moniligera* and *Synedra hennedyana* are the dominant species.

*Mastogloia angulata* Lewis, *Mas. aspera* Voigt, *Mas. asperula* Voigt, *Mas. bellatula* Voigt, *Mas. cocconeiformis* Grunow, *Mas. exilis* Hustedt, *Mas. ovum paschale* (A.S.) Mann, *Mas. undulata* Grunow, *Navicula biformis* (Grun.) Mann, *Synedrosphenia gomphonema* (Jan. et Rab.) Hustedt, *Rhabdonema sutum* Mann, *Cocconeis disrupta* var. *flexella* Grunow, *Nitzschia angustata* (W. Sm) Grunow and *Nitz. coarctata* Grunow are new records for China.

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TITLE: "Study of Adsorption State of  $N_2$  on Fe-Catalysts of Ammonia Synthesis.  
I. Laser Raman and IR Spectra"

SOURCE: Xiamen XIAMEN DAXUE XUEBAO [JOURNAL OF NATURAL SCIENCE OF XIAMEN  
UNIVERSITY] in Chinese No 1, 1982 pp 100-103

TEXT OF ENGLISH ABSTRACT: Chemisorption of  $N_2$  in the presence of  $H_2$  at  $400^\circ C$  on (a) doubly-promoted commercial iron catalyst Al<sub>10</sub>-3 and (b) Fe-Al (Raney iron), as well as on (c) Fe/MgO, has been investigated with a combination of laser Raman (Spex Ramalog-6) and IR (Hilger H887 and Perkin-Elmer 577) spectroscopy for the first time. The Raman bands observed at (a)  $1936\text{ cm}^{-1}$ , (b)  $1930\text{ cm}^{-1}$  and (c)  $1994\text{ cm}^{-1}$ , respectively, may be assigned to  $N\equiv N$  stretching of chemisorbed  $N_2$ , corresponding Raman bands not being observed with pure  $H_2$  on the above three catalysts. A  $\mu_7(\eta^2, \omega_2, \omega_2')$  "flat-lying mode" of  $N_2$  coordination previously proposed by us on 7-Fe cluster of  $\alpha$ -Fe (111) surface is discussed together with other modes of  $N_2$  coordination.

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TITLE: "Complexation of  $Fe_4S_4^*$  Cluster with ATP and Coupling of Electron Transfer with ATP Hydrolysis"

SOURCE: Xiamen XIAMEN DAXUE XUEBAO [JOURNAL OF NATURAL SCIENCE OF XIAMEN  
UNIVERSITY] in Chinese No 1, 1982 pp 104-106

TEXT OF ENGLISH ABSTRACT: Cathodic polarogram and electronic spectra of  $L_4Fe_4S_4^*$  cluster and  $L_4Fe_4S_4^*-ATP$  ( $L = -SCH_2\phi$ ) as well as the relative amount of ATP hydrolysis of the two systems,  $L_4Fe_4S_4^*-ATP$ -methylene blue and  $L_4Fe_4S_4^*-ATP$ , were investigated. The results indicate that  $Fe_4S_4^*$  could complex with ATP, resulting in a redox-potential shift to a more negative value ( $-1.16V$  to  $-1.66V$ ), thus increasing the electron donating tendency of  $L_4Fe_4S_4^*$ , and that when the electron flowed out from the  $L_4Fe_4S_4^*, nATP$  complex, hydrolysis of the coordinated ATP was greatly promoted.

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## Welding

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TITLE: "Determination of Welding Heat Source Efficiency by Measuring-Calculating  
Method"

SOURCE: Harbin HANJIE XUEBAO [TRANSACTIONS OF THE CHINA WELDING INSTITUTION] in  
Chinese No 1, 1982 pp 10-24

TEXT OF ENGLISH ABSTRACT: Knowing the actual welding heat input is the prerequisite  
for solving in a precise manner the thermal elasto-plastic problems and for evalu-  
ating residual stresses and distortions when more accurate results are expected.  
For this reason, the determination of the heat source efficiency  $\eta$  is a pressing  
subject in the course of developing welding mechanics.

In this paper, the authors present a "measuring-calculating method" which provides  
a new and accurate shortcut to determine the heat source efficiency  $\eta$ . By intro-  
ducing the proper melting latent heat  $p$ , the actual efficiency  $\eta_t$  for a linear heat  
source is given in a modified formula. The experimental data on four different

[Continuation of HANJIE XUEBAO No 1, 1982 pp 10-24]

thin plates by using TIG welding agree well with the theoretical results of calcula-  
tion. It is proved by theoretical deduction and confirmed by experimentation that  
the dimensionless value of linear heat input for forming the weld bead is the  
reciprocal of coefficient  $\eta_t$ . The principle for selecting welding parameters given  
in this paper can also be used for other fusion welding heat sources if their con-  
ditions are in compliance with those of the linear heat source. The coefficient  $\eta$   
is not only related to the welding technology and parameters, but also varies with  
the thermo-physical characteristics of the materials to be welded.

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TITLE: "The Effect of Post-weld Heat Treatment on the Properties of Stainless Steel Overlaid Joint for Pressure Vessels"

SOURCE: Harbin HANJIE XUEBAO [TRANSACTIONS OF THE CHINA WELDING INSTITUTION] in Chinese No 1, 1982 pp 37-48

TEXT OF ENGLISH ABSTRACT: This paper investigates the influence of post-weld heat treatment on the mechanical properties of stainless steel overlaid joints and discusses the relation between the change in impact toughness and micro-structure in the overlaid cladding. The base metal was Q-T treated Ni-Cr-Mo-V high strength steel. In the inner surface of the vessel, two layers of clad metal were deposited by submerged arc welding with chromium-nickel stainless steel strip as the consumable electrode. The first layer was 0Cr20Ni10 and the second layer was 00Cr20Ni10 stainless steel. A series of test specimens were taken from the overlaid cladding, bonding line and heat affected zone of welded pieces, which had been heat treated at 600, 625, 650 and 680°C for 15, 30, 50 and 100 hours. The results obtained are as follows: (1) The post-weld heat treatment temperature should not be over 650°C for Q-T treated Ni-Cr-Mo-V high strength steel. (2) All side bending

[Continuation of HANJIE XUEBAO No 1, 1982 pp 37-48]

specimens are free of cracks after bending, but the ductility in the bonding area decreases with increased time of post-weld heat treatment and its temperature. Ductility loss is associated with the width of diffusion of carbon from base metal to the overlaid cladding. (3) The toughness of the overlaid cladding decreases with increased time of post-weld heat treatment and its temperature. The decrease of toughness also depends on ferrite content and carbon content. (4) 0Cr20Ni10 low carbon stainless steel cladding is less susceptible to embrittlement than 0Cr20Ni10Nb cladding. (5) The embrittlement of 00Cr20Ni10 extra low carbon overlaid cladding after post-weld heat treatment is due to the Cr<sub>23</sub>C<sub>6</sub> precipitated along the ferrite boundaries as well as the formation of a very small amount of  $\sigma$  phase.

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